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A BIOLOGICAL INVENTORY AND EVALUATION OF THE SUDDEN BOG AREA OF NATURAL AND SCIENTIFIC INTEREST (40P/8 533955)

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1990

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SUMMARY

Sudden Bog is located in lots 15, 16 and 17, Concession 8 in the Township of North Dumfries, Regional Municpality of Waterloo, 4 km northeast of Wrigley Corners and 6 km south-southwest of Galt (Cambridge). The study area is approximately 87 hectares (218 acres) in size and is entirely under private ownership (7 landowners).

Sudden Bog is situated in Site District 7-6, a broad till plain with intervening morainic ridges and spillway valleys (Hills 1959). Within this area, Sudden Bog is situated in the Horseshore Moraines Physiographic Region (Chapman and Putnam 1984).

The existence and relative significance of the site were not recognized until as recently as 1977 (Ralph and Eagles 1977). It was subsequently included in a list of 36 critical unprotected areas in the Carolinian Life Zone of Canada (Eagles and Beechey (1985). The present study was undertaken to describe and map the vegetation communities; to identify and map significant life science features; and, to compare the significant life science features of Sudden Bog with those of two nearby Areas of Natural and Scientific Interest.

Fieldwork was conducted during August and September, 1987. Dates of visits were August 26, September 1, 2, 3 and 5. Fieldwork involved visiting all vegetation communities in the study area, mapping their relative locations, and compiling a species list for each. In addition, notes were made of such environmental parameters as soil type and moisture, microclimate, slope aspect and degree of disturbance. Incidental observations of birds, amphibians and reptiles, and mammals were also noted. Additional information resulting from a visit to the site on June 23 by Joyce Gould and Steve Varga (OMNR, Central Region), and from earlier visits to the site by knowledgeable local naturalists was also obtained.

Nineteen wetland, upland and anthropogenic vegetation communities were identified at Sudden Bog. Wetland vegetation types are confined to the major kettles and to several smaller kettle depressions scattered through the uplands. Wetland vegetation types present in the study area include open water-aquatic with submerged and floating-leaved aquatics; emergent marsh; thicket swamps; leatherleaf low shrub bog; and, black spruce-tamarack-white pine treed bog. The steep kettle slopes and tableland areas support a variety of upland forest types, including primarily oak and maple-dominated mesic deciduous forest; oak-hickory dry-mesic deciduous forest; and oak-hickory-white pine and oak-maple-white pine dry-mesic mixed forest. Several small remnant prairie communities are found along the kettle rim, at the north end of the study area. Anthropogenic community types include graminoid old field associated with the Pipeline Right-of-Way, near the south end of the study area; old field regenerating in hawthorn and dogwood; and a small plantation of Norway Spruce.

A total of 412 species of vascular plants are recorded for the Sudden Bog, including 36 species considered to be regionally rare. Six of these species: Small Beggarticks (*Bidens discoidea*), Ternate Grape Fern (*Botrychium rugulosum*), Pignut Hickory (*Carya glabra*), Downy False Foxglove (*Aureolaria virginica*), Wood Vetch (*Vicia caroliniana*) and Hill's Oak (*Quercus ellipsoidalis*) are considered to be provincially rare.

The majority of vascular plant species present at Sudden Bog are characteristic of the mesophytic woodlands of the region and southern Ontario generally. However, 42 species have Carolinian, northern or prairie/savanna affinities.

Although to date no structured surveys of the fauna of Sudden Bog have been undertaken, incidental observations of 50 species of birds, 17 amphibian and reptile species and 10 mammal species have been made. For the most part, the faunal species present at Sudden Bog are characteristic of woodland and wetland habitats in the region. However, two bird species are considered significant; the Red-bellied

Woodpecker (*Melanerpes carolinus*) and the Yellow-throated Vireo (*Vireo flavifrons*), both southern woodland species, are considered to be regionally rare.

Ten regionally significant areas were identified during the course of fieldwork. Significance was determined following criteria provided in the Revised Report Format (OMNR 1976). Most of these areas are regarded as significant due to good representation of wetland and upland vegetation, typical of the Horseshore Moraines and due to the presence of rare biota. Most of the significant areas were assessed as having extreme constraints to development. Constraints to development (extreme, high or moderate) for significant areas were determined using the Revised Report Format (OMNR 1976). Generally, all wetlands and areas with very steep slopes within the study area were identified as having extreme sensitivity.

In terms of significant life science features and overall representative value, Sudden Bog, Paris Cranberry Bog and Oliver's Bog complement each other. Each represents a markedly different bog/pond association. Although there is some replication of significant features, each of these areas support significant vascular plant species not found in the others.

In terms of rare and/or significant features, Sudden Bog supports: 1) the best developed and least disturbed suite of bog/pond wetlands, supporting one provincially rare and 12 regionally rare plant species; 2) the best and most extensive dry-mesic deciduous oak/hickory slope woodland, supporting one provincially rare and seven regionally rare plant species; 3) the only prairie community association, supporting one provincially rare and five regionally rare plant species, and; 4) the largest and most intact fringe forest buffer.

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A number of people aided in the production of this report. Joyce Gould (Central Region) accompanied the author in the field, provided determinations for moss collections and field notes from an earlier visit to the Sudden Bog. Daryl Coulson (Cambridge District) provided useful discussions with respect to bog/pond associations in the Waterloo Region. Larry Lamb (Univ. Waterloo) and Craig A. Campbell provided useful information regarding Sudden Bog and the region's flora. Barry G. Warner (Univ. Waterloo) provided useful discussions on the paleoecology of Sudden Bog and other kettle bogs in the Regional Municipality of Waterloo.

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CHAPTER I: REGIONAL BACKGROUND

(i) INTRODUCTION

The Sudden Bog is located in lots 15, 16 and 17, Concession 8 in the Township of North Dumfries, Regional Municpality of Waterloo, 4 km northeast of Wrigley Corners and 6 km south-southwest of Galt (Cambridge). Access to the site is from Waterloo Regional Road 3 (North) [Greenfield Rd.], east off Regional Road 75 [Hwy. 24A] (Figure 1).

The study area is approximately 87 hectares (218 acres) in size and is entirely under private ownership (7 landowners).

Remarkably, the existence and significance of Sudden Bog was not recognized during the International Biological Programme (IBP 1969-1971), the Environmentally Sensitive Areas (ESAs) study of the Regional Municipality of Waterloo (1976) or during subsequent natural features analysis of Site District 7-6 (Hanna 1984). It was not until 1977 that the existence of the site was recognized during a study of the Galt Ridge-Beake Pond ESA, less than one kilometer to the northeast (Ralph and Eagles 1977). Sudden Bog has since been identified as one of 36 critical unprotected areas in the Carolinian Life Zone as part of the Carolinian Canada Programme (Eagles and Beechey 1985).

(ii) PHYSICAL BACKGROUND

a. Physiography

Sudden Bog is located in Site District 7-6, a broad till plain with intervening morainic ridges and spillway valleys extending from the Niagara Escarpment in a broad band westward nearly to the shore of Lake Huron (Hills 1959). Within this area, Sudden Bog is situated in the Horseshore Moraines Physiographic Region (Chapman and Putnam 1984).

Sudden Bog is part of a kettle-kame formation situated on a "pitted outwash plain" at or near the confluence of the Galt and Paris Moraines. The area is characterized as a rugged, stoney ridge with moderately hilly to very hilly relief pitted with frequent kettle depressions. An esker, running southeast to northwest, parallels the west side of the main kettle depression. Sudden Bog itself is an irregularly shaped kettle or series of kettles, bounded by steep slopes of irregularly sorted coarse gravels and boulder till. The coarseness of the parent materials has permitted particularly steep slopes to be preserved (Karrow 1987).

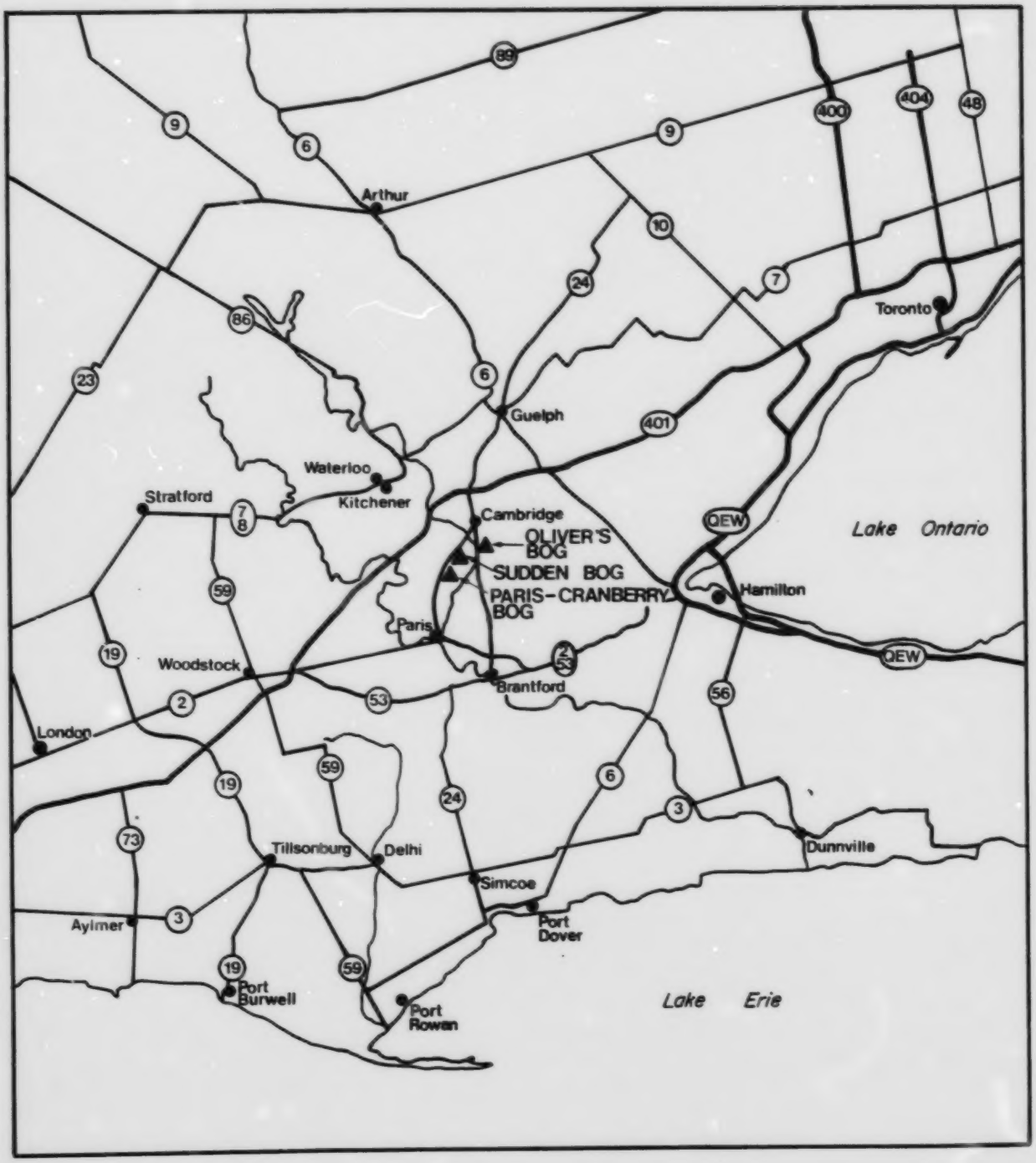
The soils of the Sudden Bog area include Mannheim and Dumfries loams, Burford gravelly loam and St. Jacobs sandy loam. These soils are generally well-drained, having developed on the stony-loam and loam tills of the Galt and Paris Moraines (Presant and Wickland 1971).

b. Climate and Microclimate

Sudden Bog is situated in the South Slopes Climatic Region (Brown *et al.* 1980), a region characterized as having a mean annual growing season slightly in excess of 200 days in length, with a mean annual "frost-free" period of 140 days. The mean summer (May to September) precipitation (38 cm) is slightly above the average for southwestern Ontario. The mean annual snowfall of roughly 127 cm is about average for southwestern Ontario.

Figure 1

Location of Sudden Bog



Scale 1:1,000,000 (approximate)

N

Considerable variation is evident in the microclimate of Sudden Bog. South and southwest-facing slopes along the northern rim of the kettle present warmer-than-normal conditions, supporting a variety of southern and prairie affinity vegetation. In contrast, northern or boreal elements of the flora are present in the largely colder-than-normal conditions prevalent along the base of the slopes and in the kettle bottom. It is expected that "frost-pooling" in the kettle depression in the spring and fall somewhat shortens the length of the "frost-free" period, contributing to the cooler microclimate.

c. History

Historically, the area surrounding Sudden Bog appears to have been open oak savanna or oak barrens. According to the original survey records of Marlett in 1816-1817 (Wood 1961 *in* Ball 1981, Langendoen and Maycock 1983), much of Dumfries Township (including South Dumfries Twp, Brant Co) was dominated by oak barrens or oak plains, with many large areas burned by extensive fires.

Much of the surrounding land had been cleared for agriculture by the turn of the century. According to local landowners, woodland in the southern portion of the study area was clear cut around 1941. The dry mixed, predominantly oak-hickory forest on the east side of the kettle was heavily logged at some point in the past decade. Trees in the mesic deciduous woodland in the northwest have been marked for firewood extraction.

(iii) REGIONAL CONTEXT OF THE VEGETATION

Site District 7-6 straddles the boundary between the Huron - Ontario Section of the Great Lakes - St. Lawrence Forest and the Niagara Section of the Deciduous Forest Region (Rowe 1972). This latter region roughly corresponds to the Carolinian Zone of Soper (1956,1962).

The Waterloo region has been botanized extensively for the past 100 years or so, resulting in two published accounts of the regions vascular flora. William Herriot, botanist and former resident of Galt, explored the vicinity of Galt around the turn of the century, the results of which were published in the Ontario Natural Science Bulletin (Herriot 1905, 1906, 1908, 1909a, 1909b, 1911, and 1913).

During the early 1940s, F.H. Montgomery conducted a survey of the flora of Waterloo County, as partial requirements for an M.A. degree from McMaster University, Hamilton (Montgomery 1945). Most recently, C.A. Campbell and L.E. Lamb of Waterloo have botanized the region extensively in order to further document its flora (Campbell and Lamb 1984) and in an attempt to re-discover many of the original collection sites of Herriot and Montgomery. In this connection, among the many interesting species discovered by Herriot were a number of "bog" species, many of which have never been rediscovered in the region. Included among these is an obscure sedge (*Carex pauciflora*) of black spruce bogs and the Cotton-grass (*Eriophorum spissum*), the latter of which was discovered during the present study. Given its close proximity to Galt and the similarity of its bog habitats to habitat data on many of Herriot's specimens, Sudden Bog has often been referred to as "Herriot's Lost Bog".

CHAPTER II: VEGETATION OF SUDDEN BOG

(i) INTRODUCTION TO VEGETATION

The vegetation of Sudden Bog consists of forested uplands and slopes supporting mesic to dry-mesic, largely oak-dominated deciduous and mixed woodlands; upland wet kettle depressions occupied by shrub thickets; and a large, irregularly-shaped kettle depression or series of kettle depressions supporting a variety of aquatic, emergent and bog associations. Remnant prairie or oak savanna, early successional deciduous and, anthropogenic vegetation communities, including old field and conifer plantation, account for a relatively small proportion of the vegetation of Sudden Bog.

(ii) COMMUNITY DESCRIPTIONS

A total of 19 wetland, upland and anthropogenic plant communities were identified within the Sudden Bog study area. These communities are delineated on Map 1. The relative areal extent of each plant community is provided in Table 1.

Community delineations and their boundaries are only approximations and should be regarded as tentative for the present.

The relationship of the plant communities to environmental parameters is presented on the accompanying vegetation matrix (Figure 2).

WETLAND VEGETATION TYPES

Wetlands are the most prominent feature of the vegetation of Sudden Bog, comprising 14.4% of the total area. The main kettle depressions as well as the many small kettle depressions of the uplands are occupied by a variety of wetland types including bogs, thicket swamps, emergent marsh and open water/aquatic communities.

1. OPEN WATER/AQUATIC (Submerged/floating aquatics)

This community-type has only limited representation at Sudden Bog and is restricted to the lagg zone around the major bog mats. The lagg has an average width of approximately 3 meters and a maximum depth of ≤1 meter. The surface of the water is largely covered by floating-leaved aquatics, including a Pondweed (*Potamogeton natans*), duckweeds (*Lemna minor* and *Spirodela polyrhiza*) and Water Smartweed (*Polygonum amphibium*). Other species present include the Pondweeds (*Potamogeton amplifolius*, *P. gramineus*, *P. pusillus* and *P. zosteriformis*), Canada Water-weed (*Elodea canadensis*) and Bladderwort (*Utricularia vulgaris*).

The extent of open water, as revealed by airphoto coverage (1972, 1978) and reflected in the width of the lagg zone, appears to have increased due to apparent accelerated drainage of runoff into the kettle over the past 10-15 years.

The microclimate is colder-than-normal and the bottom substrates are organics.

Significant species: the regionally rare pondweeds (*Potamogeton amplifolius* and *P. pusillus* var. *tenuissimus*).

Table 1: Size of Plant Communities of Sudden Bog

Plant Community	Approximate Size (ha)	Relative Size
Wetland Vegetation Types		
1. OPEN WATER/AQUATIC (Submerged/floating aquatics)	3.2 ha	4.3 %
2. EMERGENT MARSH	.8 ha	1 %
a. Bur-reed - Marsh Cinquefoil - Water-arum		
b. Manna Grass - Rice Cut-grass - Beggarticks		
3. THICKET SWAMP		
a. Buttonbush - Red-osier Dogwood - Common Elder - Winterberry	1.9 ha	2.6 %
b. Nannyberry - Winterberry	.5 ha	.7 %
4. LOW SHRUB BOG: Leatherleaf	2.8 ha	3.8 %
5. TREED BOG		
a. Black Spruce-Tamarack-White Pine	.6 ha	.8 %
b. Tamarack	.9 ha	1.2 %
UPLAND VEGETATION TYPES		
6. MESIC DECIDUOUS FOREST		
a. Red Oak - Sugar Maple - Black Cherry	26.6 ha	35.8 %
b. Red Maple	9.6 ha	12.9 %
c. Trembling Aspen	2.2 ha	3.0 %
7. DRY MESIC DECIDUOUS FOREST		
a. Oak - Hickory - Black Cherry - White Ash	3.0 ha	4.0 %
b. Large-toothed Aspen - Red Oak - Black Cherry	1.4 ha	1.9 %
8. DRY MESIC MIXED FOREST		
a. Oak - Hickory - White Pine	7.0 ha	9.4 %
b. Red Oak - Red Maple - White Pine	4.3 ha	5.8 %
9. PRAIRIE	.5 ha	.7 %
ANTHROPOGENIC VEGETATION TYPES		
10. OLD FIELD		
a. Hawthorn-Dogwood	3.3 ha	4.4 %
b. Graminoid	5.1 ha	6.9 %
11. PLANTATION	.6 ha	.8 %
	74.3 ha	100 %

Sub-strate / Temp. / Moisture regime		Arid	Very Dry	Dry	Dry Mesic	Mesic	Wet Mesic	Wet	Very Wet	Sat-urated	Open Water
Colder	Rock										
	Sand					8b	2b,3b	2b			
	Loam					8b					
	Clay										
	Organic						2b,3b	2b	2a,4,5a 5b	2a,4,5a 5b	1
Normal	Rock										
	Sand				6a,6c, 7b,8b	6a,6c, 8b, 11	2b,3b	2b			
	Loam				6a,8b 10b	6a,6b 8b	6b				
	Clay										
	Organic						2b,3b	2b,3a	2a	2a	
Warmer	Rock										
	Sand			9	7a,8a 9						
	Loam				10a,10b						
	Clay										
	Organic										

Figure 2: Vegetation Matrix for Sudden Bog

2. EMERGENT MARSH

a. Bur-reed - Marsh Cinquefoil - Water-arum

This community is found on suspended sediments and in shallow water of generally ≤50 cm in the lagg zone. On suspended or recently exposed saturated sediments Bur-reed (*Sparganium chlorocarpum*) may be a local major dominant, occasionally forming dense beds. Marsh Cinquefoil (*Potentilla palustris*), Water-arum (*Calla palustris*) and to a lesser extent Water- Willow (*Decodon verticillatus*) occur as local dominants in this community, particularly along the edge of the floating mat of the low shrub bog (community type 4). The soils are very wet to wet organics and the microclimate is normal to colder-than-normal.

Significant species: the provincially rare Smaller Beggar-ticks (*Bidens discoidea*) and the regionally rare Water-willow (*Decodon verticillatus*) and Bur-reed (*Sparganium chlorocarpum*).

b. Manna Grass - Rice Cut-grass - Beggarticks

This community occurs on recently exposed organic sediments along the outside perimeter of the lagg, forming a narrow, often discontinuous band varying in width between 30 cm and ≤1 meter. Although the species composition is variable, Manna Grass (*Glyceria canadensis*, *G. grandis*, *G. striata*), Rice Cut-grass (*Leersia oryzoides*) and Beggarticks (*Bidens* spp.), particularly Nodding Beggarticks (*Bidens cernua*), are the most frequent dominants and/or co-dominants. Also present as local minor dominants are Blue Flag (*Iris versicolor*), Spotted Jewelweed (*Impatiens capensis*), Marsh St. Johns-wort (*Triadenum fraseri*), Canada Bluejoint (*Calamagrostis canadensis*), Wool-grass (*Scirpus cyperinus*), Marsh Fern (*Thelypteris palustris*) and sedges (*Carex* spp.). Low shrubs of Meadowsweet (*Spiraea alba*) Swamp Rose (*Rosa palustris*) and Winterberry (*Ilex verticillata*), although infrequent, occur scattered throughout this community. The soils are wet to wet-mesic sandy organics and the microclimate is normal to colder-than-normal.

Significant species: the provincially rare beggarticks (*Bidens discoidea*) and 5 regionally rare species, including two beggarticks (*Bidens tripartita* and *B. vulgata*), a sedge (*Carex comosa*), Water-horehound (*Lycopus uniflorus*) and Arrow-leaved Tear-thumb (*Polygonum sagittatum*).

3. THICKET SWAMP

a. Buttonbush - Red-osier Dogwood - Common Elder - Winterberry

This community occupies many of the small kettle-depressions throughout the upland portions of the study area as well as along portions of the lagg, where it grades into low shrub bog (community type 4). The largest single example occurs in the large, open pond south of the Pipeline Right-of-way.

Species composition and dominance varies from one site to the next, however both dead and live stems of Buttonbush (*Cephalanthus occidentalis*), Red-osier Dogwood (*Cornus stolonifera*), Common Elder (*Sambucus canadensis*) and Winterberry (*Ilex verticillata*) are the most frequent components. The surface of the standing water in these kettles is typically covered by a dense blanket of duckweeds (*Lemna minor*, *Spirodela polyrhiza*) and Water-meal (*Wolffia* spp.). In exposed, drying organic soils along the margins of these ponds is a frequently dense, narrow band of emergent species, particularly Rice Cut-grass (*Leersia oryzoides*), False Nettle (*Boehmeria cylindrica*), Spotted Jewelweed (*Impatiens capensis*), Beggarticks (*Bidens* spp.) and a variety of sedges (*Carex* spp.).

The soils are wet organics and the microclimate is normal.

Significant species: the provincially rare Small Beggarticks (*Bidens discoidea*) and 5 regionally rare species, including Beggarticks (*Bidens vulgata*), Arrow-leaved Tearthumb (*Polygonum sagittatum*), Clearweed (*Pilea fontana*), Water-horehound (*Lycopus uniflorus*) and a sedge (*Carex tribuloides*).

b. Nannyberry – Winterberry

This community is restricted to a small, shallow depression at the southeast corner of the study area. Nannyberry (*Viburnum lentago*) and Winterberry (*Ilex verticillata*) are the dominant tall shrubs with lesser amounts of Common Elder (*Sambucus canadensis*) and, in better drained sites Black Raspberry (*Rubus occidentalis*). Prevalent in the herbaceous understorey are Sensitive Fern (*Onoclea sensibilis*), Spotted Jewelweed (*Impatiens capensis*), Boneset (*Eupatorium perfoliatum*) and Rough Goldenrod (*Solidago rugosa*).

Soils are wet-mesic to seasonally wet sandy-organics and the microclimate is normal to colder-than-normal.

4. LOW SHRUB BOG: Leatherleaf

Sphagnum mat dominated by the low shrub Leatherleaf (*Chamaedaphne calyculata*) constitutes the largest bog community in the study area. Widely scattered young stems of Tamarack (*Larix laricina*) and White Pine (*Pinus strobus*) occur on the mat as do low shrubs of Meadowsweet (*Spiraea alba*), Huckleberry (*Gaylussacia baccata*), and Shining Willow (*Salix lucida*).

Prominent herbaceous elements on drier portions of the mat include a Cotton-grass (*Eriophorum virginicum*), Pitcher-plant (*Sarracenia purpurea*) and Marsh Fern (*Thelypteris palustris*). Wetter depressions in the mat with exposed peat support a more diverse assemblage of herbaceous species, including Three-way Sedge (*Dulichium arundinaceum*), a sedge (*Carex canescens*), Manna Grass (*Glyceria canadensis*), Marsh St. Johns-wort (*Triadenum fraseri*), a rush (*Juncus canadensis*), sundews (*Drosera intermedia* and *D. rotundifolia*), Marsh Cinquefoil (*Potentilla palustris*) and occasionally Water-arum (*Calla palustris*).

Portions of this community appear to be degrading to wet thicket swamp and/or shrub rich marsh due apparently to higher water levels in the kettle. This is particularly evident in the northeastern-most lobe of the kettle along the northern edge of the study area where species more characteristic of thicket swamp such as willows (*Salix lucida* and *S. eriocephala*), Meadowsweet, Red-osier Dogwood (*Cornus stolonifera*) and Common Elder (*Sambucus canadensis*) have invaded the leatherleaf mat. In places where the mat has been submerged, Water-willow (*Decodon verticillatus*), Common Cattail (*Typha latifolia*), sedges (*Carex lacustris* and *C. stricta*) and Canada Bluejoint (*Calamagrostis canadensis*) have become established. Similar degradation of this community is also apparent near the south end of the study area, where Meadowsweet, Common Cattail and Nodding Beggarticks (*Bidens cernua*) dominate portions of the mat.

Very wet to wet deep peats with a generally colder-than-normal microclimate.

Significant species: the regionally rare sedges (*Carex comosa*, *C. lacustris* and *C. stricta*) and Water-willow (*Decodon verticillatus*).

5. TREED BOG

a. Black Spruce – Tamarack – White Pine

This community is restricted to the northeast lobe of the kettle. It occupies the central portions of a level to moderately hummocky sphagnum mat with low or poorly developed polsters of *Sphagnum fuscum*. Black Spruce (*Picea mariana*), Tamarack (*Larix laricina*) and White Pine (*Pinus strobus*) occur as co-dominants. Leatherleaf (*Chamaedaphne calyculata*) forms a dense low shrub layer bordering the treed zone, grading into low shrub bog (community type 4), but in the deep shade beneath the spruce and tamarack it is largely replaced by a moderately dense to sparse, low shrub layer of Bog Laurel (*Kalmia polifolia*), Bog Rosemary (*Andromeda glaucophylla*), Tall Blueberry (*Vaccinium corymbosum*), Low Blueberry (*Vaccinium angustifolium*) and, less commonly, Labrador-tea (*Ledum groenlandicum*). Small Cranberry (*Vaccinium oxycoccos*) is frequent in openings and areas where the shrub layer is sparse. Herbaceous species diversity is characteristically poor in this community. Conspicuous herbaceous species include a Cotton-grass (*Eriophorum virginicum*), a sedge (*Carex trisperma*), Pitcher-plant (*Sarracenia purpurea*) and sundews (*Drosera rotundifolia* and *D. intermedia*).

Very wet to wet deep peats with a colder-than-normal microclimate.

Significant species: the regionally rare Cotton-grass (*Eriophorum spissum*) and Swamp Dewberry (*Rubus hispidus*).

b. Tamarack

A relatively open treed bog community dominated by Tamarack (*Larix laricina*) occurs on level to low or moderately hummocky floating sphagnum mat in the northwest kettle and, to a limited extent, in the southernmost lobe of the kettle near the south end of the study area. The tamaracks range in height between approximately 3 and 5 meters. Young stems of White Pine (*Pinus strobus*) and a few small Black Spruce (*Picea mariana*) occur in this community as well, but do not achieve any degree of dominance. Leatherleaf-dominated low shrub bog (community type 4) borders much of this community. Tall Blueberry (*Vaccinium corymbosum*), Huckleberry (*Gaylussacia baccata*) and to some extent Meadowsweet (*Spiraea alba*) form occasionally dense thickets in a discontinuous zone between leatherleaf low shrub bog and the treed bog. Conspicuous components of the herbaceous layer include Cotton-grass (*Eriophorum virginicum*) and Pitcher-plant (*Sarracenia purpurea*).

Very wet to wet deep peats with a colder-than-normal microclimate.

UPLAND VEGETATION TYPES

Upland Forests are the most prevalent vegetation types at Sudden Bog, accounting for 73.5% of the total area. High variability in the composition and dominance of these forests over short distances is due to corresponding variations in slope, aspect and soil moisture.

6. MESIC DECIDUOUS FOREST

a. Red Oak - Sugar Maple - Black Cherry - White Ash

This is the largest forest community at Sudden Bog, occupying two large tableland areas on both the east and west sides of the study area. Red Oak (*Quercus rubra*) and Sugar Maple (*Acer saccharum*) are the dominant species with Sugar Maple as a sole dominant or local co-dominant with Beech (*Fagus grandifolia*) on several east or northeast-facing slopes. Black Cherry (*Prunus serotina*) and White Ash (*Fraxinus americana*) are frequent throughout the community and are co-dominants with Red Oak on somewhat drier, west-facing slopes at the extreme north end of the study area. Basswood (*Tilia americana*), Bur Oak (*Quercus macrocarpa*) and White Oak (*Quercus alba*) occur as well, the latter two species on somewhat drier sites. The understorey varies from moderately dense with saplings of Black Cherry, Choke Cherry (*Prunus virginiana*), Alternate-leaved Dogwood (*Cornus alternifolia*), Prickly Gooseberry (*Ribes cynosbati*) and Common Buckthorn (*Rhamnus cathartica*), to open, with scattered shrubs of Round-leaved Dogwood (*Cornus rugosa*), Fly-honeysuckle (*Lonicera canadensis*), Maple-leaved Viburnum (*Viburnum acerifolium*) and Witch-hazel (*Hamamelis virginiana*).
Frequent components of the herbaceous understorey include: Large-leaved Aster (*Aster macrophyllus*), Rough-leaved Rice-Grass (*Oryzopsis asperifolia*), Sweet Cicely (*Osmorhiza claytoni*), Wild Lily-of-the-Valley (*Maianthemum canadense*), Wild Sarsaparilla (*Aralia nudicaulis*), False Solomon's-seal (*Smilacina racemosa*) and Blue-stemmed Goldenrod (*Solidago caesia*). On several steep, northeast-facing slopes the herbaceous layer is dominated by ferns, particularly Wood Ferns (*Dryopteris* spp.), Christmas Fern (*Polystichum acrostichoides*) and Maidenhair Fern (*Adiantum pedatum*).

The soils are mesic, tending toward dry-mesic, sandy boulder till with partially buried blocks of limestone, and sandy till. The microclimate is normal.

Significant species: three regionally rare species, a grass (*Poa languida*), a sedge (*Carex digitalis*) and Wood-rush (*Luzula multiflora*).

b. Red Maple

This community type occurs along a linear depression paralleling the base of the southeast/northwest esker ridge. Red Maple (*Acer rubrum*) is the dominant canopy species with Sugar Maple (*Acer saccharum*) and White Ash (*Fraxinus americana*) and occasionally Beech (*Fagus grandifolia*) occurring as local codominants. Yellow Birch (*Betula alleghaniensis*) occurs scattered throughout the community, particularly along the edges of several small kettle depressions (community type 3a), as do occasional stems of White Pine (*Pinus strobus*). Blue Beech (*Carpinus caroliniana*) is a prominent understorey species.

The herbaceous layer in this community is comparatively rich with a predominance of ferns, including: Wood Ferns (*Dryopteris* spp.), Sensitive Fern (*Onoclea sensibilis*), Lady Fern (*Athyrium filix-femina*), Interrupted Fern (*Osmunda claytoniana*) and, infrequently, New York Fern (*Thelypteris noveboracensis*) and Rattlesnake Fern (*Botrychium virginianum*). Other prominent herbaceous species include: Horsebalm (*Collinsonia canadensis*), Honewort (*Cryptotaenia canadensis*), Large-flowered Bellwort (*Uvularia grandiflora*), Canada Wood Nettle (*Laportea canadensis*), Tick-trefoil (*Desmodium glutinosum*) and White Snakeroot (*Eupatorium rugosum*).

Soils are mesic to wet-mesic sandy loams and the microclimate is normal.

Significant species: the regionally rare Daisy-leaved Grape Fern (*Botrychium matricariifolium*), Oneida Grape Fern (*Botrychium oneidense*), Least Moonwort (*Botrychium simplex*) and Upland Bent Grass (*Agrostis perennans*) and Marsh Violet (*Viola affinis*).

c. Trembling Aspen

Several isolated, early successional stands of Trembling Aspen (*Populus tremuloides*) occur along the northern edge of the study area bordering cultivated fields. The canopy is generally quite open allowing a dense understorey of tall shrubs. On drier sites, bordering on dry-mesic, the understorey is dominated by Witch-hazel (*Hamamelis virginiana*), Hawthorn (*Crataegus pruinosa*) and Dogwood (*Cornus racemosa*); on a more mesic site bordering the northeastern arm of the kettle, the understorey is comprised of Alternate-leaved Dogwood (*Cornus alternifolia*).

The soils are mesic to dry-mesic sandy till and the microclimate is normal.

7. DRY MESIC DECIDUOUS FOREST

a. Oak - Hickory - Black Cherry - Red Maple

This community type is found on steep south-facing slopes of the kettle along the north edge of the study area. The moderately open canopy is dominated by Red Oak (*Quercus rubra*), White Oak (*Quercus alba*), Shagbark Hickory (*Carya ovata*), Black Cherry (*Prunus serotina*) and, to a lesser extent, Red Maple (*Acer rubrum*), particularly along the base of the slope. Stems of Basswood (*Tilia americana*), Sassafras (*Sassafras albidum*) and Pignut Hickory (*Carya glabra*) occur scattered through this community as well. Throughout much of this community the understorey is dense to moderately dense. Shrub species present in this understorey include: Round-leaved Dogwood (*Cornus rugosa*), Serviceberry (*Amelanchier arborea*), Downy Arrow-wood (*Viburnum rafinesquianum*), White Ash (*Fraxinus americana*) saplings, Honeysuckle (*Lonicera dioica*) and Poison-ivy (*Toxicodendron radicans*). Scattered through the understorey are lianas of Summer Grape (*Vitis aestivalis*).

Frequently occurring and/or prominent species in the herbaceous understorey include: the sedges (*Carex pensylvanica* and *C. digitalis*), Heart-leaved Aster (*Aster cordifolius*), Blue-stemmed Goldenrod (*Solidago caesia*), False Solomon's-seal (*Smilacina racemosa*), Tick-trefoil (*Desmodium glutinosum*), Whorled Loosestrife (*Lysimachia quadrifolia*), Woodland Sunflower (*Helianthus divaricatus*) and White Snakeroot (*Eupatorium rugosum*).

Soils are dry mesic sandy till and the microclimate is warmer-than-normal.

Significant species: the provincially rare Pignut Hickory (*Carya glabra*) and 3 regionally rare species are found in this community type. Regionally rare species are Wood-rush (*Luzula multiflora*) and sedges (*Carex cephalophora* and *C. digitalis*).

b. Large-toothed Aspen - Red Oak - Black Cherry

A small stand dominated by Large-toothed Aspen (*Populus grandidentata*), Red Oak (*Quercus rubra*) and Black Cherry (*Prunus serotina*) occurs along the top of the esker ridge along the west edge of the study area. Choke Cherry (*Prunus virginiana*) and saplings of Black Cherry are frequent in the relatively open understorey. Prevalent species in the herbaceous understorey include: the sedge (*Carex pensylvanica*), Canada Blue Grass (*Poa compressa*) and Enchanter's Nightshade (Circaea quadrisulcata).

The soil are dry-mesic sandy loam and the microclimate is normal.

8. DRY MESIC MIXED FOREST

a. Oak - Hickory - White Pine

This community occurs on steep south and southwest facing slopes around the northern and eastern perimeter of the kettle. Red Oak (*Quercus rubra*) and White Oak (*Quercus alba*), Shagbark Hickory (*Carya ovata*) and White Pine (*Pinus strobus*) dominate the overstorey. White Ash (*Fraxinus americana*) occurs scattered throughout the community, occasionally as a local co-dominant. Several small stands of Sassafras (*Sassafras albidum*) occur along steep southwest-facing slopes. The understorey is relatively open; conspicuous low shrub species include: Low Blueberry (*Vaccinium angustifolium*), Northern Bush-honeysuckle (*Diervilla lonicera*), New Jersey Tea (*Ceanothus americanus*), Carolina Rose (*Rosa carolina*) and Poison-ivy (*Toxicodendron radicans*). Prevalent in the rather sparse herbaceous layer throughout much of this community are the sedge (*Carex pensylvanica*), Rough-leaved Rice-Grass (*Oryzopsis asperifolia*), Bottle-brush Grass (*Elymus hystrix*), Wild Lily-of-the-Valley (*Maianthemum canadense*), False Solomon's-seal (*Smilacina racemosa*), Wild Sarsaparilla (*Aralia nudicaulis*), Large-leaved Aster (*Aster macrophyllus*), Heart-leaved Aster (*Aster cordifolius*), Blue-stemmed Goldenrod (*Solidago caesia*), Spreading Dogbane (*Apocynum androsaemifolium*), White Snakeroot (*Eupatorium rugosum*), Whorled Loosestrife (*Lysimachia quadrifolia*) and Cow-wheat (*Melampyrum lineare*).

Large portions of this community bordering the kettle in the northeastern portion of the study area have been heavily logged in the past decade. A dense regeneration of Blackberry (*Rubus allegheniensis*), Black Raspberry (*Rubus occidentalis*) and American Hazel (*Corylus americana*) dominates the understorey.

The soils are dry mesic sands and the microclimate is warmer-than-normal.

Significant species: the provincially rare Pignut Hickory (*Carya glabra*), and 6 regionally rare species occur in this community. Regionally rare species include False Foxglove (*Aureolaria flava*), the sedges (*Carex cephalophora* and *C. digitalis*), Wood Rush (*Luzula multiflora*) One-flowered Cancer-root (*Orobanche uniflora*) and the grass (*Poa languida*).

b. Red Oak - Red Maple - White Pine

This community type occurs on moderately steep to steep slopes along the west side of the kettles. Red Oak (*Quercus rubra*) and Red Maple (*Acer rubrum*) are codominants throughout much of the community. White Pine (*Pinus strobus*) occurs as a minor codominant throughout the community becoming more prevalent bordering the kettle. Other minor components of the canopy include Sugar Maple (*Acer saccharum*), Beech (*Fagus grandifolia*), Black Cherry (*Prunus serotina*) and Large-toothed Aspen (*Populus grandidentata*), the latter species particularly at the north end of the community. Yellow Birch (*Betula alleghaniensis*) occurs scattered along the base of the slope bordering the kettle depression.

Prominent species in the herbaceous layer include: the clubmosses (*Lycopodium lucidulum*, *L. digitatum* and *L. obscurum*), Twisted Stalk (*Streptopus roseus*), Indian Cucumber-root (*Medeola virginiana*), Solomon's-seal (*Polygonatum pubescens*), Wild Lily-of-the-Valley (*Maianthemum canadense*), Mitrewort (*Mitella diphylla*), Foamflower (*Tiarella cordifolia*), Wild Sarsaparilla (*Aralia nudicaulis*) and Shinleaf (*Pyrola elliptica*).

Soils are gravelly to sandy loam and the microclimate in normal to colder-than-normal.

Significant species: the provincially rare Ternate Grape Fern (*Botrychium rugulosum*) and the regionally rare Oneida Grape Fern (*Botrychium oneidense*) and Swamp Dewberry (*Rubus hispidus*).

9. **Prairie**

This community type is restricted to several small openings along the northern rim of the kettle. Conspicuous local dominants in the herbaceous layer are the tall prairie grasses: Big Bluestem (*Andropogon gerardii*), Little Bluestem (*Andropogon scoparius*) and Indian Grass (*Sorghastrum nutans*). Other prominent herbaceous species include Poverty Oat Grass (*Danthonia spicata*), Muhly (*Muhlenbergia glomerata*), Kalm's Brome Grass (*Bromus kalmii*), Butterflyweed (*Asclepias tuberosa*), Yellow Pimpernel (*Taenidia integerrima*), Harebell (*Campanula rotundifolia*), Wood Lily (*Lilium philadelphicum*), Seneca Snakeroot (*Polygala senega*), Wild Bergamot (*Monarda fistulosa*), Sky-blue Aster (*Aster azureus*), Prairie Thistle (*Cirsium discolor*) and Spreading Dogbane (*Apocynum androsaemifolium*). Around the edges of these openings are scattered low shrubs of New Jersey Tea (*Ceanothus americanus*), Carolina Rose (*Rosa carolina*) and American Hazel (*Corylus americana*), the latter species forming dense thickets. Poison-ivy (*Toxicodendron radicans*) is a frequent shrub component in all of the openings.

The soils are dry to dry-mesic sand and sandy till and the microclimate is warmer-than-normal.

Significant species: one provincially rare species Hills Oak (*Quercus ellipsoidalis*) and 4 regionally rare species are found in this community type. Regionally rare species include Arrow-leaved Aster (*Aster sagittifolius*), Kalm's Brome Grass (*Bromus kalmii*), Prairie Thistle (*Cirsium discolor*) and White Goldenrod (*Solidago bicolor*).

ANTHROPOGENIC VEGETATION TYPES

Anthropogenic communities account for a comparatively small amount (12.1%) of the area of Sudden Bog.

10. **OLD FIELD**

a. Hawthorn

Early successional old field communities dominated by Hawthorns (*Crataegus pruinosa*, *C. punctata*) with scattered low thickets of Dogwood (*Cornus racemosa*) occur in two areas along the eastern edge of the study area bordering cultivated fields. Herbaceous species are predominantly graminoid and include Kentucky Blue Grass (*Poa pratensis*), Canada Blue Grass (*Poa compressa*) and Timothy (*Phleum pratense*), as well as Goldenrods (*Solidago* spp.) and Cinquefoils (*Potentilla recta* and *P. simplex*). The soils are sandy till and the microclimate is warmer-than-normal.

b. Graminoid

Graminoid old field community occurs at two locations within the study area; at the extreme northwestern edge of the study area in an area recently planted in pines, and along a 20 meter wide Pipeline Right-of-Way which passes from east to west through the southern end of the study area. In addition to a predominance of grasses and Goldenrods (*Solidago* spp.), a wide variety of weedy herbaceous species are found in this community, including Annual Fleabane (*Erigeron annuus*), Horse-weed (*Conyza canadensis*), Red Clover (*Trifolium pratense*) and Cinquefoils (*Potentilla* spp.).

The soils are sandy tills and the climate is warmer-than-normal to normal.

11. **PLANTATION**

A small plantation of Norway Spruce (*Picea abies*) approximately 3-5 meters in height occurs along the edge of the graminoid old field community, in the northwestern corner of the study area. The trees are closely planted and few herbaceous species occur in the dense shade. The soils are mesic sands and the microclimate is normal.

(iii) FLORISTICS

The majority of species present in the Sudden Bog are characteristic of the mesophytic woodlands of southern Ontario. However, 42 species may be said to have Carolinian, Northern or prairie/savannna affinities (Table 2).

Sudden Bog straddles the border between the Great Lakes - St. Lawrence Forest Region and the Deciduous Region, the latter region roughly corresponding to the Carolinian Zone of Soper (1956,1962). Eight species occurring in the oak-dominated woodlands of the study area are regarded as characteristic Carolinian species. Four of these species are strictly Carolinian and are confined in their distributions in Ontario to the southwest, but Rue-Anemone (*Anemonella thalictroides*) and Summer Grape (*Vitis aestivalis*) also have major occurrences near the eastern end of Lake Ontario.

Twelve species with largely northern affinities are for the most part confined in Central Region (OMNR) to kettle depressions occupied by bogs and/or fens. Several of these species, particularly the ericaceous shrubs Bog Rosemary (*Andromeda glaucophylla*), Leatherleaf (*Chamaedaphne calyculata*), Bog Laurel (*Kalmia polifolia*) and Labrador-tea (*Ledum groenlandicum*) are at or near the southern limit of their range in Ontario at Sudden Bog.

Twenty-two species with prairie/oak savanna affinities occur in the small prairie communities and dry-mesic oak-hickory dominated woodlands at Sudden Bog. Nineteen of these species are found in the prairie communities along the northern rim of the kettle; 11 of these species are restricted to this community type.

Table 2: Floristic Affinities of the Vascular Plants of Sudden Bog

Southern/Carolinian

Anemonella thalictroides
Aureolaria flava
*Aureloaria virginica**
Carya glabra
Collinsonia canadensis
Sassafras albidum
Vicia caroliniana
Vitis aestivalis

Northern

Andromeda glaucophylla
Carex trisperma
Chamaedaphne calyculata
Drosera intermedia
Eriophorum spissum
Eriophorum virginicum
Kalmia polifolia
Ledum groenlandicum
Menyanthes trifoliata
Picea mariana
Picea glauca
Sarracenia purpurea

Prairie/Savanna

Andropogon gerardii
Andropogon scoparius
Anemone cylindrica
Asclepias tuberosa
Aster azureus
Aster sagittifolius
Bromus kalmii
Campanula rotundifolia
Ceanothus americanus
Cirsium discolor
Comandra umbellata
Corylus americana
Desmodium canadense
Desmodium paniculatum
Erigeron pulchellus
Lespedeza intermedia
Lysimachia quadrifolia
Polygala senega
Quercus ellipsoidalis
Rosa carolina
Sorghastrum nutans
Vaccinium pallidum

* Location requires confirmation. Species is included here on basis of confirmation by Dave McLeod (pers. comm. 1990) of Larry Lamb specimen collected at site August 18, 1977.

(iv) FAUNA

Faunal observations at Sudden Bog have been more or less incidental to other field work. Observations of breeding birds, amphibian and reptiles, and mammals are listed in Appendix B, C, and D, respectively.

Fifty species of birds have been recorded at Sudden Bog.

Most of these species are for the most part characteristic of woodland and wetland habitats in the region. However, two bird species are considered significant; the Red-bellied Woodpecker (*Melanerpes carolinus*) and the Yellow-throated Vireo (*Vireo flavifrons*), both southern woodland species, are considered to be regionally rare. On several occasions during the present study a male Red-bellied Woodpecker was both heard and observed in open oak woodland (community type 8a). A Yellow-throated Vireo was heard giving scolding calls in oak-hickory woodland along the northern edge of the kettle (community type 7a).

Three Wild Turkey (*Meleagris gallopavo*) were observed in open oak woodland (community type 8a) during the course of fieldwork. It seems probable that these individuals originated from a 1986 release of 32 individuals in nearby South Dumfries Twp, Brant Co (Harcus 1987).

Seventeen amphibian and reptile species encountered at Sudden Bog during the present study. None of these species are considered to be rare in either a regional or provincial context (Plourde *et al.* 1989, Francis and Campbell 1983). However, species such as Pickerel Frog (*Rana palustris*) and Ribbon Snake (*Thamnophis sauritus*), while not rare, are generally uncommon and are to a certain extent indicative of comparatively pristine wetland habitats. The Milk Snake (*Lampropeltis triangulum*) is thought to have undergone significant declines in the Waterloo Region in the last 10-15 years (C.A. Campbell, pers. comm.).

Ten species of mammals were recorded during the course of field work at Sudden Bog. None of the species encountered is considered to be significant. However, fossorial runways belonging to either the Short-tailed Shrew (*Blarina brevicauda*) and/or the provincially rare Woodland Vole (*Microtus pinetorum*) were observed on the steep, south-facing sandy slope in oak-hickory forest (community type 7a). While the former species is of both widespread and common occurrence in the province, including the Regional Municipality of Waterloo, the latter species is restricted in its distribution in Ontario almost entirely to the Carolinian Zone. Although the Woodland Vole is expected to occur in Waterloo Region, its presence has never been confirmed (Campbell and Dagg 1972).

CHAPTER III: PLANNING CONSIDERATIONS

(i) SIGNIFICANT FEATURES

a. SIGNIFICANT FLORA

Thirty-seven vascular plant species found at Sudden Bog are considered to be regionally rare (Table 3). Regionally rare species are defined as those occurring in ≤3 localities in the Regional Municipality of Waterloo (Campbell and Lamb 1984, Riley 1989).

Six species found at Sudden Bog are considered to be provincially rare: Downy False Foxglove (*Aureolaria virginica*); Small Beggarticks (*Bidens discoidea*) (White and Maher 1983); Ternate Grape Fern (*Botrychium rugulosum*) (Pryer and Britton 1987); Pignut Hickory (*Carya glabra*) (Ball and Ford 1987); Hill's Oak (*Quercus ellipsoidalis*) (Ball 1987); and Wood Vetch (*Vicia caroliniana*). The Ontario and North American distributions for these species are provided in Appendix E.

Downy False Foxglove (*Aureolaria virginica*) was not located at the site in either 1989 or 1990 field studies, but is documented from the site by a collection of Larry Lamb (Aug. 18, 1977), confirmed by Dave McLeod (1990). At that time, it was known from a sassafras grove on a southfacing slope near a field at the northern edge of the area.

Small Beggarticks (*Bidens discoidea*) is a widespread, though somewhat local species of wetlands throughout southern Ontario. Since publication of the distribution by White and Maher (1983), it has been found in many additional localities. Its discovery at Sudden Bog represents an addition to the flora of the Regional Municipality of Waterloo (Cambell and Lamb 1984).

Ternate Grape Fern (*Botrychium rugulosum*) is evidently a rare and highly localized species in southern Ontario. Ususally only one or a very few individuals are found at any one locality, frequently growing with other members of the genus *Botrychium*, forming a "genus community" (Wagner and Wagner 1982). During the course of the present study, *Botrychium rugulosum* was found at one site (community type 8b) growing in company with other *Botrychium* species, including Dissected Grape Fern (*Botrychium dissectum* f. *dissectum* and f. *obliquum*), Oneida Grape Fern (*B. oneidense*) and Leathery Grape Fern (*B. multifidum*). Its discovery at Sudden Bog represents only the second occurrence for the Regional Municipality of Waterloo (C.A. Campbell, pers. comm.).

Pignut Hickory (*Carya glabra*) is a rare and local species of dry to dry-mesic deciduous forest and savanna habitats within the Carolinian Zone, where it typically occurs as scattered, individual trees. The Sudden Bog population constitutes one of three such occurrences in the Regional Municipality of Waterloo.

Hill's Oak (*Quercus ellipsoidalis*) is a mid-western species forming oak-barren or oak-savanna communities, where fire appears to play an instrumental role in its maintenance (Curtis 1959, White 1983). According to Wood (1961 *in* Ball 1981, Langendoen and Maycock 1983), historically much of southeastern North Dumfries Twp (including the area of Sudden Bog) and adjacent South Dumfries Twp (Brant Co) was occupied by "oak plains" with large areas burned by extensive fires. In southern Ontario, Hill's Oak is presently restricted to to old fence rows, hedgerows and roadsides (Ball 1981) and remnant prairie communities. In southern Ontario there is evidently a strong correlation between the distribution of this species and with the orientation and extent of the Galt and Paris Moraines. In addition to the southern Ontario occurrences mapped by Ball (1987), Hill's Oak has been found recently in extreme northeast Elgin County, southwest Oxford County and in the vicinity of Dundas, Regional Municipality of Hamilton-Wentworth (M.E. Gartshore, pers. comm.).

Wood Vetch (*Vicia caroliniana*) is a woodland herb of restricted southern distribution in Ontario, usually of dry or dry-mesic woods.

Table 3: Significant Vascular Plants of Sudden Bog

Species	Common Name	Source
Nationally and Provincially Rare [1]		
Aureolaria virginica	Downy False Foxglove	LL (pers. comm, D. McLeod)
Bidens discoidea	Small Beggarticks	DAS
Botrychium rugulosum	Ternate Grape Fern	DAS
Carya glabra	Pignut Hickory	DAS;R&E
Quercus ellipsoidalis	Hill's Oak	DAS
Vicia caroliniana	Wood Vetch	GA
Regionally Rare [2]		
Agrostis perennans	Upland Bent Grass	DAS
Aster sagittifolius	Arrow-leaved Aster	DAS
Aureolaria flava	False Foxglove	DAS;R&E
Bidens tripartita	Beggarticks	DAS
Bidens vulgata	Beggarticks	DAS
Botrychium matricarifolium	Daisy-leaved Grape Fern	R&E;LL
Botrychium oneidense	Oneida Grape Fern	DAS
Botrychium simplex	Least Moonwort	LL
Bromus kalmii	Kalm's Brome	JG,SV;DAS
Carex cephalophora	Sedge	JG,SV;DAS
Carex comosa	Sedge	JG,SV;DAS
Carex digitalis	Sedge	JG,SV;DAS
Carex lacustris	Sedge	JG,SV;DAS
Carex stricta	Sedge	JG,SV;DAS
Carex tribuloides	Sedge	JG,SV;DAS
Cirsium discolor	Prairie Thistle	R&E;DAS
Decodon verticillatus	Water Willow	JG,SV;DAS
Eriophorum spissum	Cotton-grass	JG,SV
Luzula multiflora	Wood Rush	DAS
Lycopus uniflorus	Water-horehound	DAS
Orobanche uniflora	One-flowered Cancer-root	DAS
Pilea fontana	Clearweed, Richweed	DAS
Poa languida	Blue Grass	JG,SV;DAS
Polygonum sagittatum	Arrow-leaved Smartweed	R&E;DAS
Potamogetom amplifolius	Large-leaved Pondweed	DAS
Potamogeton pusillus var. *tenuissimus*	Small Pondweed	DAS
Rubus hispidus	Swamp Dewberry	DAS
Solidago bicolor	White Goldenrod	DAS
Sparganium chlorocarpum	Green-fruited Bur-reed	DAS
Vaccinium pallidum	Early Sweet Blueberry	GA
Viola affinis	Marsh Violet	JG,SV

[1] Rare in Ontario; following Argus *et al.* (1982-1987) and Pryor and Argus (1988).

[2] Rare in the Regional Municipality of Waterloo (Campbell and Lamb (1984); defined as ≤3 stations.

b. SIGNIFICANT AREAS

A total of 10 regionally significant areas were identified during the course of the present study (Map 2), all elements of a representative pond/bog complex of the Horseshore Moraines of Site District 7-6. Anthropogenic community types (10 and 11) and successional stands of Trembling Aspen (community type 6c) were excluded from consideration. The significance of these sites was determined according to the criteria outlined in the Revised Report Format (OMNR 1976). The relative significance of these areas is summarized in Table 4.

Representative value was determined by evaluating the area in terms of its representation of pond/bog vegetation complexes within the Horseshore Moraines Physiographic Region of Site District 7-6 (Hanna 1984). Specifically, comparisons were made with the Paris Cranberry Bog (527935, 40P/8) and Oliver's Bog (580974, 40P/8), two nearby provincially significant ANSIs within Cambridge District, selected to represent pond/bog complexes on the Horseshoe Moraines. Degree of disturbance was also used in the assessment of representativeness.

Scientific value was determined through an evaluation of the area in terms of its potential for paleoecological, phytogeographical and autecological research. The area has already been the subject of paleoecological research by researchers from the University of Waterloo (Warner *et al.* 1989).

Interpretive and educational value was determined by evaluating the area in terms of its potential to interpret ecological processes.

Significant habitat/species values were assessed based on the presence of regionally and/or provincially rare flora and fauna and the rarity of the habitat. The number of rare species and the presence of similar habitat in two nearby ANSIs was assessed.

Table 4: Significance of Selected Areas in Sudden Bog Area of Natural and Scientific Interest

	Representative Value	Scientific Value	Interpretive Value	Significant Habitat/Features
E1	A	B	A	C
E2	A	C	C	A
E3	C	C	C	A
E4	A	A	A	A
E6	A	B	B	A
E7	A	C	C	A
H1	A	B	A	A
M1	B	C	B	A

A - Very High
B - High
C - Moderate

The overall significance of individual significant areas was determined through an evaluation of its local, regional and provincial significance.

Constraints to development (extreme, high or moderate) for significant areas were determined using the Revised Report Format (OMNR 1976). Generally, all wetlands and areas with very steep slopes within the study area were identified as having extreme sensitivity.

E1 OPEN WATER/AQUATIC: Submerged/floating aquatics (community type 1)

The open water community in the lagg zone is typical of those found in bog complexes in the region. A larger example of an open water community with a comparatively richer diversity of submerged and floating aquatics is found in the lagg at Paris Cranberry Bog ANSI. Within Sudden Bog, the open water community adds to the overall diversity of habitats. This community also harbours 2 regionally rare aquatic plant species.

E2 EMERGENT MARSH (community types 2a,b)

Emergent marshes are common wetland types in the region. A larger example with a higher diversity of aquatic emergent species is found at Paris Cranberry Bog ANSI.

Emergent marsh (E2) supports substantial populations of the nationally and provincially rare Small Beggarticks (*Bidens discoidea*), a species unknown elsewhere in the region, as well as populations of 7 regionally rare plant species.

E3 THICKET SWAMP (community type 3a)

Thicket swamps of this type are common in the region and are represented in both the Paris Cranberry Bog ANSI and Oliver's Bog ANSI. Examples of this community type at Paris Cranberry Bog are more extensive than those within the study area.

At Sudden Bog, thicket swamp supports populations of the nationally and provincially rare Small Beggarticks (*Bidens discoidea*), in addition to 5 regionally rare plant species.

E4 LOW SHRUB BOG (community type 4) and E5 TREED BOG (community types 5a,b)

Bogs are a representative feature of the Horseshore Moraines Physographic Region. A similar, but larger example of treed bog exhibiting classic seral bog succession is represented in the Oliver's Bog ANSI. However, it has been impacted through peat extraction and alteration of water levels. Treed bogs in the study area remain relatively undisturbed. Low shrub bog is also represented at Oliver's Bog ANSI, supporting several regionally significant plant species not represented in the study area. However, larger examples of this community are found at Sudden Bog.

Bog communities in the study area contain two regionally rare plants species: a Cotton-grass (*Eriophorum spissum*) known in the region only from Sudden Bog; and Swamp Dewberry (*Rubus hispidus*), a species new to the region's flora.

Bogs in the study area have very high scientific value in terms of their importance as areas for paleoecological research. In addition, the interpretive value of these bogs is high insofar as a variety of bog successional stages are visible from several points around the rim of the kettle.

E6 DRY MESIC DECIDUOUS FOREST (community type 7a)

Dry mesic deciduous forests dominated by oak and hickory are representative of south slope forests on the southern end of the Horseshoe Moraines Physiographic Region and of the Deciduous or Carolinian Zone, generally. Limited examples of this community type are found at Paris Cranberry Bog ANSI, but they are small and relatively disturbed. This community type is not represented at Oliver's Bog ANSI.

This community type supports habitat for the provincially rare Pignut Hickory (*Carya glabra*), three regionally rare plant species and the regionally rare Yellow-throated Vireo (*Vireo flavifrons*).

E7 DRY MESIC MIXED FOREST (community types 8a,b)

Dry mesic mixed forests are representative of south slope forests at the southern end of the Horseshore Moraines Physiographic Region and of the Carolinian Zone, generally. These forests are absent from both the Paris Cranberry Bog and Oliver's Bog ANSIs.

This forest provides habitat for two provincially rare species, Pignut Hickory (*Carya glabra*) and Ternate Grape Fern (*Botrychium rugulosum*), 8 regionally rare plants species, and the regionally rare Red-bellied Woodpecker (*Melanerpes carolinus*).

H1 PRAIRIE (community type 9)

Remnant prairie communities are rare within the Horseshore Moraines Physiographic Region and Site District 7-6, generally. Within the Horseshore Moraines, prairie communities are represented elsewhere only in the Grand River Forests ANSI (520900, 40P/8). Paris Cranberry Bog ANSI has several species with prairie/oak savanna affinities, but no intact associations.

This community type provides habitat for the provincially rare Hill's Oak (*Quercus ellipsoidalis*) and four regionally rare plant species. In addition, this community type supports an outstanding diversity of plant species with prairie affinities. A total of 21 species with prairie/oak savanna affinities are represented in this habitat.

M1 MESIC DECIDUOUS FOREST (Red Oak - Sugar Maple - Black Cherry)(community type 6a) and M2 MESIC DECIDUOUS FOREST (Red Maple)(community type 6b)

These forests are representative of those occurring on uplands in the Horseshore Moraines and Site District 7-6, generally. Examples of this community type are absent from the Paris Cranberry Bog and Oliver's Bog ANSIs. Similar stands are found in Alps Woods ANSI (500965, 40P/8).

Eight regionally rare plant species are found in these forests.

c. COMPARISON OF THE LIFE SCIENCE FEATURES OF SUDDEN BOG WITH TWO NEARBY AREAS OF NATURAL AND SCIENTIFIC INTEREST

Given its good representation of life science features in the Horseshore Moraines physiographic unit of Site District 7-6, it is recommended that Sudden Bog be adopted as a provincially significant Area of Natural and Scientific Interest.

Within Site District 7-6, Hanna (1984) selected two other bog/pond complexes on the Horseshoe Moraines as candidate nature reserves: the Paris Cranberry Bog [Cranberry Bog Park Reserve] (527935, 40P/8) and Oliver's Bog (580974, 40P/8).

In terms of significant features and overall representative value, Sudden Bog, Paris Cranberry Bog and Oliver's Bog complement each other. Each represents a markedly different bog/pond association. This is particularly evident in comparing Paris Cranberry Bog with either Sudden Bog or Oliver's Bog. Whereas both Oliver's Bog and Sudden Bog contain classical black spruce/tamarack treed bog associations, Paris Cranberry Bog represents a minerotrophic floating fen in transition from poor to rich fen phase. A comparison of species with Bog, Bog/Fen, and/or Fen affinities present at each of the sites is presented in Table 5. Moreover, although there is some replication of significant features, each area supports significant vascular plant species not found in the others. A comparison of the significant vascular flora of these three areas is provided in Table 6.

In terms of rare and/or significant features, Sudden Bog supports: 1) the best developed and least disturbed suite of bog/pond wetlands, supporting one provincially rare and 12 regionally rare plant species; 2) the best and most extensive dry-mesic deciduous oak/hickory slope woodland, supporting three provincially rare and seven regionally rare plant species; 3) the only prairie community association, supporting one provincially rare and five regionally rare plant species, and; 4) the largest and most intact fringe forest buffer.

The Paris Cranberry Bog ANSI contains several features either absent or poorly represented at Sudden Bog: 1) a rich (minerotrophic) fen, a feature with either limited or no representation at either of the other two bogs; 2) an extensive bulrush marsh dominated by the regionally significant Hardstem Bulrush (*Scirpus acutus*); 3) an extensive floating aquatic community dominated by the regionally rare Water-shield (*Brasenia schreberi*), and; 4) the most extensive buttonbush/dogwood/willow thicket swamp. Paris Cranberry Bog has only limited oak-hickory fringe forest, although this association does support the provincially rare Pignut Hickory (*Carya glabra*) and Hill's Oak (*Quercus ellipsoidalis*). However, the Paris Cranberry Bog has only very limited buffering capability. Alignment of the secondary road at the west end of the area is apparently interfering with the hydrology of the kettle. High and or fluctuating waterlevels in the basin appear to be hastening the deterioration of the bog mat from fen to shrub-rich marsh. The presence of a private residence in close proximity to the edge of the basin, in addition to unbuffered cultivated land and active pasture bordering the east side of the kettle are further threats to the integrity of the wetland.

Oliver's Bog ANSI, supports an extensive black spruce/tamarack treed bog and some leatherleaf shrub bog/poor fen. However, the area has very limited buffering capability insofar as it is bounded on the east and south sides by cultivated fields and pasture, and on the north and west sides by a heavily grazed fringe of red oak/red maple/white pine woods (Macdonald 1971). Moreover, the integrity of the area has to some extent been compromised by limited peat extraction and the presence of a residence.

In conclusion, Sudden Bog provides equal or better (and complementary) representation of pond/bog kettle ecosystems on the Horseshoe Moraines of Site District 7-6. Moreover, Sudden Bog has superior community and species diversity, and less disturbed site conditions, especially in relation to the adjacent, surrounding slope forests. For these reasons, the Sudden Bog is recommended as a provincial ANSI, to be added to those already identified on the Horseshoe Moraines of Site District 7-6.

TABLE 5: A Comparison of Species with Bog and/or Fen Affinities at Sudden Bog, Paris Cranberry Bog and Oliver's Bog

Species	Sudden	Paris–Cranberry	Oliver's
BOG			
Drosera intermedia	X	X	
Eriophorum spissum	X		X
Eriophorum virginicum	X	X	X
Kalmia polifolia	X	X	
Nemopanthus mucronata	X		
Picea mariana	X		X
Vaccinium angustifolium	X		
Vaccinium corymbosum	X		X
Vaccinium oxycoccos	X	X	X
BOG/FEN			
Aronia prunifolia	X		
Carex trisperma	X		X
Chamaedaphne calyculata	X	X	X
Drosera rotundifolia	X	X	X
Hypericum boreale			X
Larix laricina	X	X	X
Ledum groenlandicum	X		X
Sarracenia purpurea	X	X	X
Vaccinium macrocarpon	X	X	X
FEN			
Andromeda glaucophylla	X	X	X
Aster borealis		X	
Calopogon tuberosus			X
Carex limosa		X	X
Cladium mariscoides		X	
Equisetum fluviatile		X	
Eriphorum gracile			X
Galium labradoricum		X	
Menyanthes trifoliata	X	X	
Muhlenbergia glomerata		X	
Pogonia ophioglossoides		X	
Potentilla fruticosa		X	
Rhynchospora alba		X	
Salix pedicellaris		X	
Solidago uliginosa		X	
Utricularia cornuta		X	
Utricularia intermedia	X	X	

TABLE 6: A Comparison of the Significant Vascular Flora of Sudden Bog, Paris Cranberry Bog and Oliver's Bog

Species	Sudden	Paris Cranberry	Oliver's
Nationally and Provincially Rare [1]			
Aureolaria virginica	X		
Bidens discoidea	X		
Botrychium rugulosum	X		
Carya glabra	X	X	
Quercus ellipsoidalis	X	X	
Vicia caroliniana	X		
Regionally Rare [2]			
Arethusa bulbosa			X
Agrostis perennans	X		
Aster sagittifolius	X		
Aster umbellatus		X	
Aureolaria flava	X		
Bidens tripartita	X		
Bidens vulgata	X		
Botrychium matricariifolium			
Botrychium oneidense	X		
Botrychium simplex	X		
Brasenia schreberi		X	
Bromus kalmii	X		
Carex cephalophora	X		
Carex comosa	X	X	X
Carex digitalis	X		
Carex lacustris	X		
Carex lasiocarpa		X	X
Carex stricta	X	X	
Carex tribuloides	X		
Cirsium discolor	X		
Cyperus strigosus		X	
Decodon verticillatus	X		X
Eleocharis olivacea		X	
Eriophorum gracile			X
Eriophorum spissum	X		
Galium labradoricum		X	
Luzula multiflora	X		
Lycopodium inundatum		X	X
Lycopus uniflorus	X	X	
Malaxis unifolia			X
Orobanche uniflora	X		
Pilea fontana	X		
Poa languida	X		
Polygonum sagittatum	X		

Potamogeton pusillus var. *tenuissimus*	X	X
Rubus hispidus	X	
Sagittaria rigida		X
Solidago bicolor	X	
Scirpus acutus		X
Sparganium chlorocarpum	X	X
Sporobolus vaginiflorus		X
Utricularia minor		X
Vaccinium pallidum	X	
Viola affinis	X	

[1] Rare in Ontario; following Argus *et al.* (1982-1987) and Pryor and Argus (1988).

[2] Rare in the Regional Municipality of Waterloo (Campbell and Lamb (1984); defined as ≤3 stations.

(ii) ENVIRONMENTAL ANALYSIS

Within Sudden Bog, the significant areas (Map 2) were assessed as having extreme (E), high (H) or moderate (M) constraints to development. The criteria used to assign such rankings have been outlined in the previous section of the report. Wetlands (E1-E5) of the kettle basin are closely linked hydrologically and sensitive to alterations in water levels. In addition, the predominantly organic soils of the wetlands are sensitive to compaction and consequently cannot withstand the pressures associated with development. Dry mesic deciduous (E6) and dry mesic mixed forests (E7) are situated on steep, precipitous slopes vulnerable to erosion and consequently cannot withstand intensive use or development.

The prairie community (H1) is considered to be an area of high constraint. Although the communities are situated along the kettle rim and adjoining tableland, the soils are sandy and easily eroded. Additionally, the community type provides habitat for a large number of rare and/or phytogeographically significant vascular plant species.

The mesic deciduous forests (M1, M2) were assessed as having moderate constraints to development in view of their location on essentially level tableland with deeper soils.

(iii) MANAGEMENT CONSIDERATIONS

1. Given its excellent representation of life science features of kettle landforms in the Horseshore Moraines physiographic unit of Site District 7-6, it is recommended that Sudden Bog be adopted as a provincially significant Area of Natural and Scientific Interest.

2. An appreciation of the significance of the life science features within the ANSI by the owners of the site should be encouraged. Land owner contact by the Natural Heritage Stewardship Program and offers of property tax reductions through the Conservation Land Tax Reduction Program have already been undertaken. The necessity and benefits of informative, informal discussions with them, to develop and maintain goodwill, can only aid in achieving the goal of protecting the area's significant features.

3. The boundary of the Sudden Bog study area should be amended to exclude areas of cultivated land at the extreme north, east and south edges of the area (see Map 1).

4. Any management protocols leading to changes in the hydrology of the area should be carefully considered. Interference with the hydrology of kettle mires poses the single most serious threat to these sites (B.G. Warner, pers. comm.). Aggregate extraction below the water table, in the vicinity of the bog, could conceivably alter the hydrology of the kettle. For this same reason, logging of the slope forests, such that surface drainage and sediment runoff would be increased, should be discouraged. Longterm hydrological changes in the bog are also linked to the underlying aquifer system, the variability of which is not yet clearly understood.

5. All-terrain vehicles should not be permitted in the kettle. Above and beyond the obvious potential threat to the fragile bog mats posed by snowmobiles, the operation of ATVs on the steep kettle slopes poses serious threats to the slopes' stability.

6. A thriving population of Glossy Buckthorn (*Rhamnus frangula*) is currently established along the edge of low shrub bog along the northeast edge of the study area. This species is an aggressive alien which has invaded and become well-established in the shrub thicket surrounding the Sifton Bog in London, where it threatens to displace native species. Some consideration should be given toward its control or ultimate eradication.

7. Populations of rare plants should be monitored on a regular basis in order to assess their status. This would be most appropriate for provincial rare species, particularly the Ternate Grape Fern (*Botrychium rugulosum*) which characteristically occurs at low population levels. The location of the 1977 population of Downy False Foxglove (*Aureolaria virginica*) should be confirmed as soon as possible.

8. Additional floral surveys are required to adequately sample the spring flora. Little or no fieldwork has been conducted at Sudden Bog during the early spring.

9. No structured faunal survey has ever been conducted at Sudden Bog. A detailed inventory of the fauna of the area could well reveal the presence of significant breeding birds. The warm south-facing slopes may well support populations of the Woodland Vole (*Microtus pinetorum*), a provincially uncommon to rare, Carolinian small mammal.

10. The area should be inspected periodically to assess changes in vegetation, use of the site and level of disturbance.

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APPENDIX A: VASCULAR PLANTS OF SUDDEN BOG

A total of 409 species (415 taxa) have been recorded in the study area. An additional 5 species have been reported but require confirmation and are not included in the body of this checklist. Fifty-six (56) species or 14.5% of the total flora are regarded as introduced/non-native taxa. These are denoted by a "+" symbol in the left margin.

Nomenclature and taxonomic arrangement of this list follows Riley (1989).

All observations are those of the author except where indicated. Taxa for which voucher specimens were collected during the present study are indicated. Taxa included solely on the authority of other observers are indicated by the following acronyms: R&E - (Ralph and Eagles 1977); LL - Larry E. Lamb (University of Waterloo); Joyce Gould - JG, Gary Allen - GA and Steve Varga - SV (Central Region, Ontario Ministry of Natural Resources).

Species	Common Name	Community Number	Source
LYCOPODIACEAE	**CLUBMOSS FAMILY**		
Lycopodium digitatum A. Br.	Crowfoot Clubmoss	6b,8b	
Lycopodium lucidulum Michx.	Shining Clubmoss	6b,8b	DAS (TRTE)
Lycopodium obscurum L.	Round-branched Ground-pine	6b,8b	
EQUISETACEAE	**HORSETAIL FAMILY**		
Equisetum arvense L.	Field Horsetail	2b,3a	
Equisetum hyemale L. var. *affine* (Engelm. A.A. Eat.	Scouring-rush	9	
OPHIOGLOSSACEAE	**ADDER'S-TONGUE FAMILY**		
Botrychium dissectum Spreng.	Dissected Grape Fern		
f. *dissectum*		6b,8b	
f. *obliquum*	Oblique Grape Fern	6,8b	DAS (TRTE)
Botrychium matricari-ifolium A. Br. *ex* Koch	Daisy-leaved Grape Fern	6b	LL,R&E

Species	Common Name	Community Number	Source
Botrychium multifidum (Gmel.) Rupr.	Leather-leaved Grape Fern	8b	DAS (TRTE)
Botrychium oneidense (Gilib.) House	Oneida Grape Fern	6b,8b	DAS (TRTE)
Botrychium rugulosum Wagner	Ternate Grape Fern	8b	DAS (TRTE)
Botrychium simplex E. Hitch.	Least Moonwort	6b	LL
Botrychium virginianum (L.) Sw.	Rattlesnake Fern	6,7a	
OSMUNDACEAE	**ROYAL FERN FAMILY**		
Osmunda cinnamomea L.	Cinnamon Fern	3a,4	
Osmunda claytoniana L.	Interrupted Fern	6b	
DENNSTAEDTIACEAE	**BRACKEN FAMILY**		
Pteridium aquilinum (L.) Kuhn	Bracken	6c,7a,8	
ADIANTACEAE	**MAIDENHAIR FERN FAMILY**		
Adiantum pedatum L.	Maidenhair Fern	6	
ASPLENIACEAE	**SPLEENWORT FAMILY**		
Athyrium filix-femina (L.) Roth var. *michauxii* (Spreng.) Fern.	Northeastern Lady Fern	3a,6	
Cystopteris tenuis (Michx.) Desv. (*C. fragilis* (L.) Bernh. var. *mackayi* Lawson)	Fragile Fern	6a	DAS (TRTE)

Species	Common Name	Community Number	Source
Dryopteris carthusiana (Vill.) H.P. Fuchs (*D. spinulosa* (O.F. Muell.) Watt)	Spinulose Wood Fern	3a,6	
Dryopteris cristata (L.) Gray	Crested Wood Fern	3a	LL,JG/SV
Dryopteris intermedia Willd.) Gray	Glandular Wood Fern	6	
Dryopteris marginalis (L.) Gray	Marginal Wood Fern	6,8	
Dryopteris X *triploidea* Wherry (*D. carthusiana* X *D. intermedia)*	Hybrid Wood Fern	6	
Onoclea sensibilis L.	Sensitive Fern	3	
Polystichum acrostichoides (Michx.) Schott	Christmas Fern	6a	
THELYPTERIDACEAE	**BEECH FERN FAMILY**		
Thelypteris noveboracensis (L.) Nieum.	New York Fern	6b	LL,JG/SV
Thelypteris palustris (Salisb.) Schott	Marsh Fern	2,3a,4,5b	
PINACEAE	**PINE FAMILY**		
Larix laricina (Du Roi) K. Koch	Tamarack	4,5	
+*Picea abies* (L.) Karst.	Norway Spruce	11	
Picea glauca (Moench)	White Spruce	5a	R&E
Picea mariana (Mill.) BSP	Black Spruce	5	
Pinus strobus L.	White Pine	4,5,6b,8	

Species	Common Name	Community Number	Source
TYPHACEAE	**CATTAIL FAMILY**		
Typha latifolia L.	Common Cattail	2,3a,4,5b	
SPARGANIACEAE	**BUR-REED FAMILY**		
Sparganium chlorocarpum Rydb.	Green-fruited Bur-reed	2a	DAS (TRTE)
POTAMOGETONACEAE	**PONDWEED FAMILY**		
Potamogeton amplifolius Tuckerm.	Large-leaved Pondweed	1	DAS (TRTE)
Potamogeton gramineus L.	Grass-leaved Pondweed	1	
Potamogeton natans L.	Pondweed	1	JG(TRTE),DAS
Potamogeton pusillus L. var. *tenuissimus* Mert. & Koch. (*P. berchtoldii* Fieber)	Pondweed	1	DAS (TRTE)
Potamogeton zosteriformis Fern.	Flat-stemmed Pondweed	1	DAS (TRTE)
HYDROCHARITACEAE	**FROG'S-BIT FAMILY**		
Elodea canadensis Michx. (*Anacharis canadensis* (Michx.) Richards	Canada Water-weed	1	
POACEAE	**GRASS FAMILY**		
+*Agropyron repens* (L.) Beauv.	Quack Grass	10b	
+*Agrostis gigantea* Roth.	Redtop	2b,10b	
Agrostis perennans (Walt.) Tuckerm.	Upland Bent Grass	6b	DAS (TRTE)

Species	Common Name	Community Number	Source
Andropogon gerardii Vitm.	Big Bluestem	9	DAS (TRTE)
Andropogon scoparius Michx.	Little Bluestem	9	DAS (TRTE)
Brachyelytrum erectum (Schreb.) Beauv.	Bearded Shorthusk	6b,8b	
Bromus ciliatus L.	Fringed Brome Grass	2b	
+*Bromus inermis* Leyss.	Smooth Brome Grass	9,10b	
Bromus kalmii Gray	Kalm's Brome Grass	9	DAS (TRTE)
Calamagrostis canadensis (Michx.) Beauv.	Canada Blue-joint	2b,4	
+*Dactylis glomerata* L.	Orchard Grass	9,10b	
Danthonia spicata (L.) Beauv.	Poverty Oat Grass	7a,8a,9	
+*Digitaria sanguinalis* (L.) Scop.	Large Crabgrass	10b	
Elymus hystrix L.	Bottle-brush Grass	6a,7a,8a	
Festuca obtusa Biehl.	Nodding Fescue	6a,7a	
Glyceria canadensis (Michx.) Trin.	Rattlesnake Manna Grass	2b,4	JG(TRTE),DAS
Glyceria grandis S. Wats.	Tall Manna Grass	2b	
Glyceria striata (Lam.) A.S. Hitchc.	Fowl Manna Grass	2b,3	
Leersia oryzoides (L.) Sw.	Rice Cut Grass	2b,3a	
Muhlenbergia glomerata (Willd.) Trin.	Muhly Grass	9	DAS (TRTE)
Oryzopsis asperifolia Michx.	Rough-leaved Rice-Grass	6,7,8	

Species	Common Name	Community Number	Source
Panicum capillare L.	Witch Grass	2b,10b	
Panicum lanuginosum Ell. var. *implicatum* (Scribn.) Fern.	Panic Grass	8a,9	
Panicum latifolium L.	Broad-leaved Panic Grass	6a,7a,8a	JG(TRTE),DAS
+*Panicum mileaceum* L.	Common Millet	10b	DAS (TRTE)
Phalaris arundinacea L.	Reed Canary Grass	2b	
+*Phleum pratense* L.	Timothy	10	
+*Poa annua* L.	Annual Blue Grass	11	
Poa compressa L.	Canada Blue Grass	6a,c,7,8,9,10,11	
Poa languida A.S. Hitchc.	Languid Blue Grass	6a,8a	JG(TRTE),DAS
+*Poa pratensis* L.	Kentucky Blue Grass	10	
Schizachne purpurascens (Torr.) Sw.	False Melic Grass	6a,b,8	
+*Setaria glauca* (L.) Beauv.	Yellow Foxtail	10b	
+*Setaria viridis* (L.) Beauv.	Green Foxtail	10b	
Sorghastrum nutans (L.) Nash	Indian Grass	9	DAS (TRTE)
CYPERACEAE	**SEDGE FAMILY**		
Carex arctata Boott	Sedge	6a,b	
Carex bebbii (Bailey) Fern.	Sedge	2b,3a	
Carex blanda Dew.	Sedge	6a	JG (TRTE)
Carex canescens L.	Sedge	4,5	JG(TRTE),DAS

Species	Common Name	Community Number	Source
Carex cephalophora Muhl. *ex* Willd.	Sedge	7a,8a	JG(TRTE),DAS
Carex communis Bailey	Sedge	7a	JG,SV
Carex comosa Boott	Sedge	2b,4	
Carex cristatella Britt.	Sedge	2b,3,	
Carex deweyana Schw.	Sedge	6,8b	
Carex digitalis Willd.	Sedge	6a,7a,8a	JG(TRTE),DAS
Carex lacustris Willd.	Sedge	4	
Carex laxiflora Lam.	Sedge	6a	JG (TRTE)
Carex pedunculata Muhl. *ex* Wild.	Sedge	6a,b	
Carex pensylvanica Lam.	Sedge	6,7,8,9	JG(TRTE),DAS
Carex pseudo-cyperus L.	Sedge	2b,3a	
Carex radiata (Wahl) Sm. (*C. rosea* auct.	Sedge	6b	
Carex retrorsa Schw.	Sedge	3a,b	
Carex rosea Schk. *ex* Willd. (*C. convoluta* Mack.)	Sedge	6,7,8	JG(TRTE),DAS
Carex stipata Muhl. *ex* Willd.	Sedge	2b,3a	
Carex stricta Lam.	Sedge	4	JG(TRTE),DAS
Carex tribuloides Wahl	Sedge	3a	JG (TRTE)
Carex trisperma Dew.	Sedge	5a	JG(TRTE),DAS
Dulichium arundinaceum (L.) Britt.	Three-way Sedge	4	

Species	Common Name	Community Number	Source
Eleocharis erythropoda Steud.	Spike-rush	3a	
Eleocharis obtusa (Willd.) Schult.	Spike-rush	2b	DAS (TRTE)
Eriophorum spissum Fern.	Cotton-grass	5a	JG (TRTE)
Eriophorum virginicum L.	Tawny Cotton-grass	4,5	DAS (TRTE)
Scirpus cyperinus (L.) Kunth	Wool-grass	2b	
ARACEAE	**ARUM FAMILY**		
Calla palustris L.	Wild Calla; Water-arum	2a,4	
LEMNACEAE	**DUCKWEED FAMILY**		
Lemna minor L.	Common Duckweed	1,2a,3a	
Lemna trisulca L.	Star Duckweed	3a	
Spirodela polyrhiza (L.) Schleid.	Greater Duckweed	1,2a,3a	DAS (TRTE)
Wolffia borealis (Engelm.) Landolt	Water-meal	3a	
Wolffia columbiana Karst.	Water-meal	3a	
JUNCACEAE	**RUSH FAMILY**		
Juncus canadensis La Harpe	Rush	2b,4	JG(TRTE),DAS
Juncus pylaei La Harpe (*J. effusus* L. var. *pylaei* (La Harpe) Fern. & Wieg.)	Rush	2b	
Juncus tenuis Willd.	Rush	11	

Species	Common Name	Community Number	Source
Luzula acuminata Raf.	Wood Rush	6a,b	
Luzula multiflora (Retz.) Lej.	Wood Rush	6a,7a,8a	
LILIACEAE	**LILY FAMILY**		
Asparagus officinalis L.	Asparagus	9	
Lilium philadelphicum L.	Wood Lily	9	JG,SV
Maianthemum canadense Desf.	Wild Lily-of-the Valley	6a,b,7,8	
Medeola virginiana L.	Indian Cucumber-root	6b,8b	
Polygonatum pubescens (Willd.) Pursh	Solomon's-seal	6b,8b	
Smilacina racemosa (L.) Desf.	False Solomon's-seal	6,7,8	
Smilacina stellata (L.) Desf.	Starry False Solomon's-seal	6b	
Smilax herbacea L.	Carrionflower	6a,b,7a	
Streptopus roseus Michx.	Twisted Stalk	6b,8b	JG(TRTE),DAS
Trillium erectum L.	Red Trillium	6b	
Trillium grandiflorum (Michx.) Salisb.	White Trillium	6a,b	
Uvularia grandiflora Sm.	Large-flowered Bellwort	6a,b	
IRIDACEAE	**IRIS FAMILY**		
Iris versicolor L.	Wild Blue Flag	2,3a,4	

Species	Common Name	Community Number	Source
ORCHIDACEAE	**ORCHID FAMILY**		
Corallorhiza maculata (Raf.) Raf.	Spotted Coral-root	6a	R&E
Cypripedium calceolus L. var. *pubescens* (Willd.) Corr.	Yellow Lady's-slipper	6a	
Cypripedium reginae Walt.	Showy Lady's-slipper		LL
+*Epipactis helleborine* (L.) Crantz	Helleborine	6a	
SALICACEAE	**WILLOW FAMILY**		
Populus grandidentata Michx.	Large-toothed Aspen	7,8	
Populus tremuloides Michx.	Trembling Aspen	6c	
Salix bebbiana Sarg.	Bebb's Willow	2b,3a	
Salix eriocephala Michx.	Heart-leaved Willow	2b,4	
Salix lucida Muhl.	Shining Willow	4	JG(TRTE),DAS
Salix nigra L.	Black Willow		R&E
Salix petiolaris Sm.	Slender Willow	4	
+*Salix purpurea* L.	Purple Osier	4	DAS (TRTE)
JUGLANDACEAE	**WALNUT FAMILY**		
Carya cordiformis (Wang.) K. Koch	Bitternut Hickory	6a	
Carya glabra (Mill.) Sweet	Pignut Hickory	7a,8a	
Carya ovata (Mill.) K. Koch	Shagbark Hickory	7a,8a	

Species	Common Name	Community Number	Source
BETULACEAE	**BIRCH FAMILY**		
Betula alleghaniensis Britt.	Yellow Birch	6b,8b	
Betula papyrifera Marsh.	White Birch		
Carpinus caroliniana Walt.	Blue Beech; Hornbeam	6b	
Corylus americana Walt.	American Hazel	8a,9	
Corylus cornuta Marsh.	Beaked Hazel	8b	DAS (TRTE)
FAGACEAE	**BEECH FAMILY**		
Fagus grandifolia Ehrh.	Beech	6a,b,8b	
Quercus alba L.	White Oak	6a,7a,8a	
Quercus ellipsoidalis E.J. Hill	Hill's Oak	9	
Quercus macrocarpa Michx.	Bur Oak	6a	
Quercus rubra L.	Red Oak	6a,7,8	
ULMACEAE	**ELM FAMILY**		
Celtis occidentalis L.	Hackberry		R&E
URTICACEAE	**NETTLE FAMILY**		
Boehmeria cylindrica (L.) Sw.	False Nettle	2b,3,6b	
Laportea canadensis (L.) Wedd.	Canada Wood Nettle	6b	
Pilea fontana (Lunell) Rydb.	Richweed; Clearweed	3a	DAS (TRTE)
Pilea pumila (L.) Gray	Richweed; Clearweed	6b	DAS (TRTE)

Species	Common Name	Community Number	Source
Urtica dioica L. var. *gracilis* (Ait.) Seland.	American Stinging Nettle	3a	
SANTALACEAE	**SANDALWOOD FAMILY**		
Comandra umbellata (L.) Nutt. ssp. *pallida* (A. DC.) M. Piehl	Bastard Toadflax	9	
POLYGONACEAE	**BUCKWHEAT FAMILY**		
+*Polygonum arenastrum* Boreau	Prostrate Knotweed	10b	
Polygonum amphibium L. (*P. natans* (Michx.) Eat.)	Water Smartweed	1,2	DAS (TRTE)
+*Polygonum convolvulus* L.	Wild Buckwheat	11	
Polygonum hydropiperoides Michx.	Mild Marshpepper	2b,3a	
Polygonum lapathifolium L.	Pale Smartweed	2b	
Polygonum sagittatum L.	Arrow-leaved Tear-thumb	2b,3a,4	JG(TRTE),DAS
+*Rumex obtusifolius* L.	Bitter Dock	3a	
CARYOPHYLLACEAE	**PINK FAMILY**		
+*Cerastium fontanum* Baumg. ssp. *triviale* (Link) Jatas	Mouse-eared Chickweed	7a,8a,10b	
+*Dianthus armeria* L.	Deptford Pink	10b	
+*Stellaria media* (L.) Vill.	Chickweed	11	

Species	Common Name	Community Number	Source
RANUNCULACEAE	**CROWFOOT FAMILY**		
Actaea pachypoda Ell.	White Baneberry	6a,b	
Actaea rubra (Ait.) Willd.	Red Baneberry	6b,8b	
Anemone canadensis L.	Canada Anemone	2b	
Anemone cylindrica Gray	Thimbleweed	9	
Anemone quinquefolia L.	Wood Anemone	6a,7a	
Anemone virginiana L.	Thimbleweed	7a	
Anemonella thalictroides (L.) Spach	Rue-anemone	7a,8a	JG(TRTE),DAS
Aquilegia canadensis L.	Columbine	7a,8a	
Hepatica americana (DC.) Der	Round-lobed Hepatica	7a	
Ranunculus abortivus L.	Small-flowered Buttercup	6a	
Ranunculus sceleratus L.	Cursed Crowfoot	2b	JG(TRTE),DAS
Ranunculus pensylvanicus L. f.	Bristly Buttercup	2b	
Thalictrum dioicum L.	Early Meadow-rue	6a,b	
BERBERIDACEAE	**BARBERRY FAMILY**		
+*Berberis thunbergii* DC.	Japanese Barberry	6a	
+*Berberis vulgaris* L.	Common Barberry	6a	
Podophyllum peltatum L.	May-apple; Mandrake	6a	
LAURACEAE	**LAUREL FAMILY**		
Sassafras albidum L.	Sassafras	7a,8a	

Species	Common Name	Community Number	Source
BRASSICACEAE	**MUSTARD FAMILY**		
Arabis canadensis L.	Sicklepod	7a	JG (TRTE)
+*Capsella bursa-pastoris* (L.) Medic.	Shepherd's-purse	10b	
SARRACENIACEAE	**PITCHER-PLANT FAMILY**		
Sarracenia purpurea L.	Pitcher-plant	4,5	
DROSERACEAE	**SUNDEW FAMILY**		
Drosera intermedia Hayne	Spatulate-leaved Sundew	4,5	
Drosera rotundifolia L.	Round-leaved Sundew	4,5	
PENTHORACEAE	**STONECROP FAMILY**		
Penthorum sedoides L.	Ditch Stonecrop	2b	
SAXIFRAGACEAE	**SAXIFRAGE FAMILY**		
Mitella diphylla L.	Mitrewort	6b,8b	
Saxifraga virginiensis Michx.	Early Saxifrage	7a,8a,9	
Tiarella cordifolia L.	Foamflower	8b	
GROSSULARIACEAE	**GOOSEBERRY FAMILY**		
Ribes americanum Mill.	Wild Black Currant	6a	JG,SV
Ribes cynosbati L.	Prickly Gooseberry	6a	
+*Ribes rubrum* L. (*R. sativum* Syme)	Red Currant	6a	

Species	Common Name	Community Number	Source
HAMAMELIDACEAE	**WITCH-HAZEL FAMILY**		
Hamamelis virginiana L.	Witch-hazel	6a,7a,8a	
ROSACEAE	**ROSE FAMILY**		
Agrimonia gryposepala Wallr.	Agrimony	10	
Amelanchier arborea (Michx. f.) Fern.	Juneberry; Service-berry	6a,7a	
Aronia prunifolia (Marsh.) Rehd.	Chokeberry	9	
Crataegus pruinosa (Wendl.) K. Koch	Hawthorn	6a,7a,8a,10a	DAS (TRTE)
Crataegus punctata Jacq.	Hawthorn	6c,10a	
Fragaria vesca L.	Woodland Strawberry	6a	
Fragaria virginiana Dcne.	Strawberry	6,8a	
Geum aleppicum Jacq.	Yellow Avens	6b	
Geum canadense Jacq.	White Avens	6c	
+*Malus pumila* Mill.	Apple	10a	
Potentilla norvegica L.	Rough Cinquefoil	3a	
Potentilla palustris (L.) Scop.	Marsh Cinquefoil	2a,4a	
+*Potentilla recta* L.	Rough-fruited Cinquefoil	10	
Potentilla simplex Michx.	Common or Old-field Cinquefoil	7a,8a,10	
Prunus americana Marsh.	Wild Plum		R&E
Prunus serotina Ehrh.	Black Cherry	6a,b,7,8	

Species	Common Name	Community Number	Source
Prunus virginiana L.	Chokecherry	6a,b	
Rosa blanda Ait.	Smooth Wild Rose	10b	
Rosa carolina L.	Carolina Rose	7a,8a,9	DAS (TRTE)
Rosa palustris Marsh.	Swamp Rose	2b	
Rubus allegheniensis Porter	Common Blackberry	8a	
Rubus hispidus L.	Swamp Dewberry	5a,8b	
Rubus occidentalis L.	Black Raspberry	3b,8a	
Rubus strigosus Michx.	Wild Red Raspberry	6a,8a	
Spiraea alba Du Roi	Meadowsweet	2b,3a,4,5b	
Waldsteinia fragarioides (Michx.) Tratt.	Barren Strawberry	6b,8b	
FABACEAE	**PEA FAMILY**		
Amphicarpaea bracteata (L.) Fern.	Hog-peanut	3a,6b,7a	
Desmodium canadense (L.)	Showy Tick-trefoil	9	
Desmodium glutinosum (Muhl.) Wood	Pointed-leaved Tick-trefoil	6a,b,7a,8a	
Desmodium nudiflorum (L.) DC.	Naked-flowered Tick-trefoil	7a	
Desmodium paniculatum (L.) DC.	Tick-trefoil	8a	R&E
Lathyrus ochroleucus Hook.	Pale Vetchling	7a,9	JG(TRTE),DAS
Lespedeza intermedia (S. Wats.)	Wand-like Bush-clover	7a,8a	
+*Medicago lupulina* L.	Black Medic	10b	

Species	Common Name	Community Number	Source
Medicago sativa L.	Alfalfa		
+ssp. *sativa*		10b	
+ssp. *falcata* (L.) Arcangeli (*M. falcata* L.)	Yellow Lucerne	10b	DAS (TRTE)
+*Melilotus alba* Desr.	White Sweet-clover	10b	
+*Melilotus officinalis* (L.) Lam.	Yellow Sweet-clover	10b	
Vicia americana Willd.	Vetch		R&E
Vicia caroliniana Walt.	Wood Vetch	7,8(?)	GA (TRTE)
+*Vicia cracca* L.	Bird Vetch	7a,10b	
+*Vicia tetrasperma* (L.) Schreb.	Sparrow Vetch	10b	
GERANIACEAE	**GERANIUM FAMILY**		
Geranium maculatum L.	Wild Geranium	6a	
Geranium robertianum L.	Herb-Robert	6a	
OXALIDACEAE	**WOOD-SORREL FAMILY**		
Oxalis fontana Bunge (*O. stricta* auct. amer., *non* L., *O. europaea* Jordan	Wood-sorrel	10b,11	
POLYGALACEAE	**MILKWORT FAMILY**		
Polygala senega L.	Seneca-snakeroot	7a,8a,9	
EUPHORBIACEAE	**SPURGE FAMILY**		
Acalypha rhomboidea Raf.	Three-seeded Mercury	3a	
+*Euphorbia cyparissias* L.	Cypress Spurge	10b	

Species	Common Name	Community Number	Source
ANACARDIACEAE	**CASHEW FAMILY**		
Rhus typhina L.	Staghorn Sumac	9	
Toxicodendron radicans (L.) Kuntze var. *rydbergii* (Rydb.) Erskin (*Rhus radicans* L.)	Poison Ivy	3a,6,7,8,9	
AQUIFOLIACEAE	**HOLLY FAMILY**		
Ilex verticillata (L.) Gray	Winterberry	3,5b	
Nemopanthus mucronata (L.) Loes.	Mountain-holly		R&E
CELASTRACEAE	**BITTERSWEET FAMILY**		
Celastrus scandens L.	Climbing Bittersweet	7a	
ACERACEAE	**MAPLE FAMILY**		
Acer rubrum L.	Red Maple	6a,b,7a,8	
Acer saccharum Marsh.	Sugar Maple	6a,b,8b	
Acer saccharinum L.	Silver Maple		R&E
Acer spicatum L.	Mountain Maple		R&E
BALSAMINACEAE	**TOUCH ME NOT FAMILY**		
Impatiens capensis Meerb.	Spotted Jewelweed	2b,3,4	
RHAMNACEAE	**BUCKTHORN FAMILY**		
Ceanothus americanus L.	New Jersey Tea	8a,9	
+*Rhamnus cathartica* L.	Common Buckthorn	6a	

Species	Common Name	Community Number	Source
+*Rhamnus frangula* L.	Glossy Buckthorn	4	DAS (TRTE)
VITACEAE	**GRAPE FAMILY**		
Parthenocissus inserta (A. Kerner) K. Fritsch	Virginia Creeper	6a,b,7a	
Vitis aestivalis Michx.	Summer Grape	7a,8a	DAS (TRTE)
Vitis riparia Michx.	Riverbank Grape	7a	DAS (TRTE)
TILIACEAE	**LINDEN FAMILY**		
Tilia americana L.	Basswood	6a	
HYPERICACEAE	**ST. JOHN'S WORT FAMILY**		
+*Hypericum perforatum* L.	Common St. John's-wort	9,10	
Hypericum punctatum Lam.	Spotted St. John's--wort	7a	DAS (TRTE)
Triadenum fraseri (Spach)	Marsh St. John's-wort	2b,3a,4	Gl.
VIOLACEAE	**VIOLET FAMILY**		
Viola affinis Le Conte	Marsh Violet	6b	JG,SV
Viola canadensis L.	Canada Violet		R&E
Viola incognita Brain.	Sweet White Violet	3a	
Viola pubescens Ait.	Yellow Violet	6a,b	
Viola sororia Willd.	Common Blue Violet	6a	JG,SV
LYTHRACEAE	**LOOSESTRIFE FAMILY**		
Decodon verticillatus (L.) Ell.	Water Willow	2a,4	

Species	Common Name	Community Number	Source
+*Lythrum salicaria* L.	Purple Loosestrife	3a	
ONAGRACEAE	**EVENING-PRIMROSE FAMILY**		
Circaea alpina L.	Dwarf Enchanter's Nightshade	6a	JG,SV
Circaea quadrisulcata (Maxim.) Franch. & Sav.	Enchanter's Nightshade	6,7,8	
Epilobium ciliatum Raf.	Sticky Willowherb	2b,3	
Epilobium coloratum Bieh.	Willowherb	2b	
+*Epilobium parviflorum*	Willowherb	2b	DAS (TRTE)
Ludwigia palustris (L.) Ell.	False Loosestrife	2b	
Oenothera parviflora L.	Small-flowered Evening-primrose	10b	
ARALIACEAE	**GINSENG FAMILY**		
Aralia nudicaulis L.	Wild Sarsaparilla	6a,b,8a,b	
APIACEAE	**CARROT FAMILY**		
Cicuta bulbifera L.	Bulbous Water-hemlock	2b,3a	
Cryptotaenia canadensis (L.) DC.	Honewort	6b	
+*Daucus carota* L.	Wild Carrot; Queen Anne's-lace	10b	
Osmorhiza claytonii (Michx.) Clarke	Sweet Cicely	6a,b	
Sanicula gregaria Bickn.	Snakeroot	6b	JG/SV
Sanicula marilandica L.	Black Snakeroot	6a,b	JG(TRTE),DAS

Species	Common Name	Community Number	Source
Taenidia integerrima (L.)	Yellow Pimpernel	7a,8a,9	JG(TRTE),DAS
CORNACEAE	**DOGWOOD FAMILY**		
Cornus alternifolia L. f.	Alternate-leaved Dogwood	6a,8b	
Cornus canadensis L.	Bunchberry	3a	
Cornus racemosa Lam.	Grey Dogwood	6c,7a,10a	
Cornus rugosa Lam.	Round-leaved Dogwood	6a,7a,8	
Cornus stolonifera Michx.	Red-osier Dogwood	3,4	
PYROLACEAE	**WINTERGREEN FAMILY**		
Chimaphila umbellata (L.)	Pipsissewa	8b	
Monotropa uniflora (L.)	Indian-pipe Gray	6a	
Orthilia secunda (L.)	One-sided Pyrola House	8b	DAS (TRTE)
Pyrola americana Sweet (*P. rotundifolia* L.)	Round-leaf Shinleaf	8	
Pyrola elliptica Nutt.	Shinleaf	8b	
ERICACEAE	**HEATH FAMILY**		
Andromeda glaucophylla	Bog-rosemary Link	4,5	DAS (TRTE)
Chamaedaphne calyculata (L.) Moench	Leatherleaf	4,5	DAS (TRTE)
Gaultheria procumbens L.	Wintergreen	7a,8	
Gaylussacia baccata (Wang.) K. Koch	Black Huckleberry	4,8a	

Species	Common Name	Community Number	Source
Kalmia polifolia Wang.	Bog Laurel	4,5	DAS (TRTE)
Ledum groenlandicum Oeder	Labrador-tea	5a	
Vaccinium angustifolium Ait.	Lowbush Blueberry	5a,6a,7a,8a	
Vaccinium corymbosum L.	Highbush Blueberry	5	JG(TRTE),DAS
Vaccinium macrocarpon Ait.	Large Cranberry	5	R&E
Vaccinium oxycoccus L.	Small Cranberry	5a	JG(TRTE),DAS
Vaccinium pallidum Ait.	Early Sweet Blueberry	7,8(?)	GA (TRTE)
PRIMULACEAE	**PRIMROSE FAMILY**		
Lysimachia quadrifolia L.	Whorled Loosestrife	6a,7a,8a	DAS (TRTE)
Lysimachia thyrsiflora L.	Tufted Loosestrife	2b,3a	
GENTIANACEAE	**GENTIAN FAMILY**		
Menyanthes trifoliata L.	Bog Buckbean	4	
OLEACEAE	**OLIVE FAMILY**		
Fraxinus americana L.	White Ash	6a,b,7a,8	
APOCYNACEAE	**DOGBANE FAMILY**		
Apocynum androsaemifolium L.	Spreading Dogbane	6a,7,8,9	
Apocynum X *medium* Greene	*(A. androsaemifolium* X *A. cannabinum)*		R&E
ASCLEPIADACEAE	**MILKWEED FAMILY**		
Asclepias exaltata L.	Poke Milkweed	7a,8a	
Asclepias incarnata L.	Swamp Milkweed	2b,3a	

Species	Common Name	Community Number	Source
Asclepias syriaca L.	Common Milkweed	10	
Asclepias tuberosa L.	Butterflyweed	9	
CONVOLVULACEAE	**MORNING GLORY FAMILY**		
Calystegia spithamea (L.) Pursh (*Convolvulus spithameus* L.)	Low Bindweed	9	
Cuscuta gronovii Willd.	Swamp Dodder	3a	
BORAGINACEAE	**BORAGE FAMILY**		
Hackelia virginiana (L.) Johnston	Beggar's-lice	7a	
VERBENACEAE	**VERVAIN FAMILY**		
Verbena hastata L.	Blue Vervain	2b	
Verbena urticifolia L.	White Vervain	3b	
LAMIACEAE	**MINT FAMILY**		
Collinsonia canadensis L.	Horsebalm	6b	DAS (TRTE)
+*Leonurus cardiaca* L.	Motherwort	11	
Lycopus americanus Muhl.	American Water-horehound	2b	
Lycopus uniflorus Michx.	Water-horehound	2b,3a	
Mentha arvensis L.	Field Mint	10	
Monarda fistulosa L.	Wild Bergamot	9	
+*Nepeta cataria* L.	Catnip	10	
Prunella vulgaris L.	Heal-all	11	

Species	Common Name	Community Number	Source
Satureja vulgaris (L.) Fritsch	Wild Basil	6a,7a	
Scutellaria galericulata L. (*S. epilobiifolia* A. Ham.)	Common Skullcap	2b,3a	DAS (TRTE)
Scutellaria lateriflora L.	Mad-dog Skullcap	3a	
SOLANACEAE	**NIGHTSHADE FAMILY**		
+*Solanum dulcamara* L.	Bittersweet	2b,3a	
SCROPHULARIACEAE	**FIGWORT FAMILY**		
Aureolaria flava (L.) Pennell	Smooth False Foxglove	8a	DAS (TRTE)
Aureolaria virginica (L). Pennell	Downy False Foxglove	7(?)	LL
+*Linaria vulgaris* Hill.	Butter-and-eggs	10	
Melampyrum lineare Desr.	Cow-wheat	8a	
Pedicularis canadensis L.	Wood-betony; Common Lousewort	6a	
+*Verbascum thapsus* L.	Common Mullein	7a,10	
+*Veronica officinalis* L.	Common Speedwell	9,10	
Vernonica scutellata L.	Marsh Speedwell	2b	
+*Veronica serpyllifolia* L.	Thyme-leaved Speedwell	10b	
OROBANCHACEAE	**BROOM-RAPE FAMILY**		
Conopholis americana (L.) Wallr.	Squawroot	8a	

Species	Common Name	Community Number	Source
Epifagus virginiana (L.) Bart.	Beech-drops	6a	
Orobanche uniflora L.	Cancer-root	8a	
LENTIBULARIACEAE	**BLADDERWORT FAMILY**		
Utricularia gibba L.	Humped Bladderwort	2b	
Utricularia intermedia Hayne	Flat-leaved Bladderwort	4	
Utricularia vulgaris L.	Common Bladderwort	1	DAS (TRTE)
PHRYMACEAE	**LOPSEED FAMILY**		
Phryma leptostachya L.	Lopseed	6a,8a	
RUBIACEAE	**MADDER FAMILY**		
Cephalanthus occidentalis L.	Buttonbush	3a,4	
Galium aparine L.	Cleavers	6a	
Galium boreale L.	Northern Bedstraw	7a	
Galium circaezans Michx.	Wild Licorice	6a	JG (TRTE)
Galium lanceolatum Torr.	Wild Licorice	8a	
+*Galium mollugo* L.	Bedstraw	7a	DAS (TRTE)
Galium trifidum L.	Bedstraw	3a	
Galium triflorum Michx.	Sweet-scented Bedstraw	6a,b,7a	
Mitchella repens L.	Partridge-berry	6a,b,8b	

Species	Common Name	Community Number	Source
CAPRIFOLIACEAE	**HONEYSUCKLE FAMILY**		
Diervilla lonicera Mill.	Northern Bush-honeysuckle	8a	
Lonicera canadensis Marsh.	Fly-honeysuckle	6a,b	
Lonicera dioica L.	Glaucous Honeysuckle	6a,7a,8a	
Sambucus canadensis L.	Common Elder	2b,3,4	
Sambucus pubens Michx.	Red-berried Elder	6a	
Viburnum acerifolium L. Viburnum	Maple-leaved	6a,7a,8a	
Viburnum lentago L.	Nannyberry	3	
Viburnum rafinesquianum Schultes	Downy Arrow-wood	6a,7a	
DIPSACACEAE	**TEASEL FAMILY**		
+*Dipsacus fullonum* L. (*D. sylvestris* auct. Amer., non Hudson)	Teasel	10b	
CUCURBITACEAE	**GOURD FAMILY**		
Echinocystis lobata (Michx.) T.& G.	Wild Cucumber	3	
CAMPANULACEAE	**BELLFLOWER FAMILY**		
Campanula aparinoides Pursh	Marsh-bellflower	2b	
Campanula rotundifolia L.	Harebell	9	
LOBELIACEAE	**LOBELIA FAMILY**		
Lobelia inflata L.	Indian Tobacco	11	

Species	Common Name	Community Number	Source
ASTERACEAE	**ASTER FAMILY**		
Ambrosia artemisiifolia L.	Common Ragweed	10b	
Antennaria parlinii Fern. (*A. plantaginifolia* (L.) Richards)	Plantain-leaved Pussy-toes	8a	
Aster azureus Lindl.	Sky-blue Aster	9	DAS (TRTE)
Aster cordifolius L.	Heart-leaved Aster	6a,7a,8a	
Aster lanceolatus Willd.	Tall White Aster	10	
Aster lateriflorus (L.) Britt.	Calico Aster	6b	
Aster macrophyllus L.	Large-leaved Aster	6a,7a,8	
Aster nove-angliae L. (*Virgulus* n. (L.) Rev. & Keen.)	New England Aster	9,10	
Aster puniceus L.	Red-stemmed Aster	3	
Aster sagittifolius	Arrow-leaved Aster	9	
Bidens cernua L.	Nodding Beggar-ticks	2b,3,4	DAS (TRTE)
Bidens discoidea (T.&G.)	Smaller Beggar-ticks	2,3a	DAS (TRTE)
Bidens frondosa L.	Devils Beggar-ticks	2b	JG,SV
Bidens tripartita L.	Beggar-ticks	2b	DAS (TRTE)
Bidens vulgata Greene	Tall Beggar-ticks	2b,3a	DAS (TRTE)
+*Carduus nutans* L.	Nodding Thistle	10b	
+*Carduus acanthoides* L. X *Carduus nutans* L.		10b	DAS (TRTE)
+*Chrysanthemum leucanthemum* L.	Ox-eye Daisy	10	
Cirsium discolor	Prairie Thistle	9	DAS (TRTE)

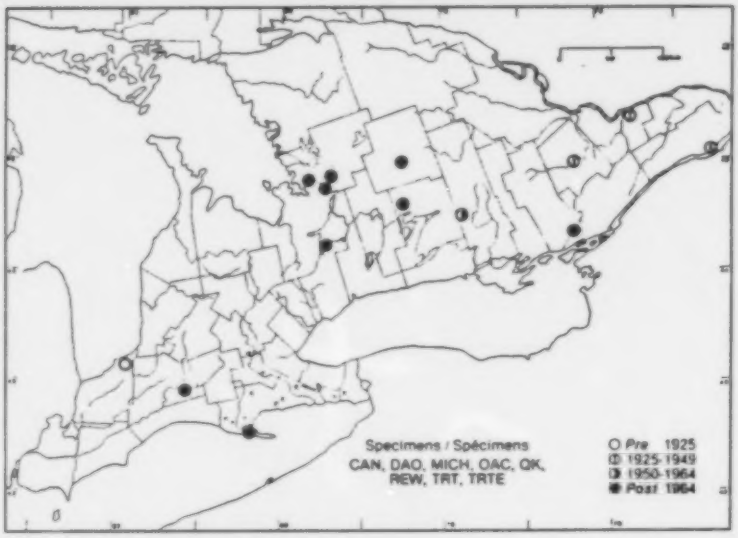
Species	Common Name	Community Number	Source
+*Cirsium vulgare* (Savi) Tenore	Bull Thistle	2b,10b	
Conyza canadensis (L.) Cronq.	Horse-weed	10	
Erigeron annuus (L.) Pers. ssp. *annuus*	Annual Fleabane	10	
ssp. *strigosus* (Muhl. ex Willd.) Wagenitz	Rough Fleabane		R&E
Erigeron philadelphicus L.	Philadelphia Fleabane	6a	
Erigeron pulchellus Michx.	Robin's-plantain	7a,8a	
Eupatorium perfoliatum L.	Boneset	2b,3	
Eupatorium rugosum Houtt.	White Snakeroot	6a,7,8	
Euthamia graminifolia (L.) Nutt. (*Solidago graminifolia* (L.) Salisb.)	Grass-leaved Goldenrod	10	
Helianthus divaricatus L.	Woodland Sunflower	7a,8a,9	
+*Hieracium caespitosum* Dumort. (*H. pratense* Tausch)	Yellow Hawkweed	10b	
+*Hieracium vulgatum* (Fries) Almquist	Common Hawkweed	6a	JG (TRTE)
Prenanthes altissima L.	Tall Lettuce	6a	
Rudbeckia hirta L.	Black-eyed Susan	9,10	
Senecio aureus L.	Golden Ragwort	3a	
Solidago bicolor L.	White Goldenrod	9	

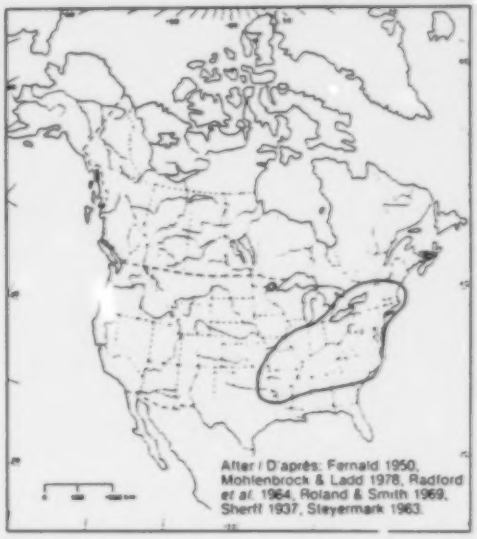
Species	Common Name	Community Number	Source
Solidago caesia L.	Blue-stemmed Goldenrod	6a,b,7,8	
Solidago canadensis L.	Canada Goldenrod	10	
Solidago nemoralis Ait.	Gray Goldenrod	9,10	
Solidago rugosa Ait.	Rough Goldenrod	2b,3b	
+*Taraxacum officinale* Weber	Common Dandelion	6a	
+*Tragopogon dubius* Scop.	Goat's-beard	10	
+*Tussilago farfara* L.	Coltsfoot	6a	
Species Requiring Confirmation			
Aureolaria virginica (L.)	Downy Foxglove Pennell	8a	R&E, LL
Lespedeza violacea (L.) Pers.	Bushclover		R&E
Pontederia cordata L.	Pickerelweed		R&E
Ranunculus allegheniensis Britt.	Allegheny Crowfoot		R&E
Smilax rotundifolia L.	Catbriar		R&E

APPENDIX B: DISTRIBUTION IN ONTARIO AND NORTH AMERICA OF SIX PROVINCIALLY RARE PLANT SPECIES AT SUDDEN BOG

***Bidens discoidea* (T. & G.) Britt.**

Small beggar-ticks
Bident discoïde

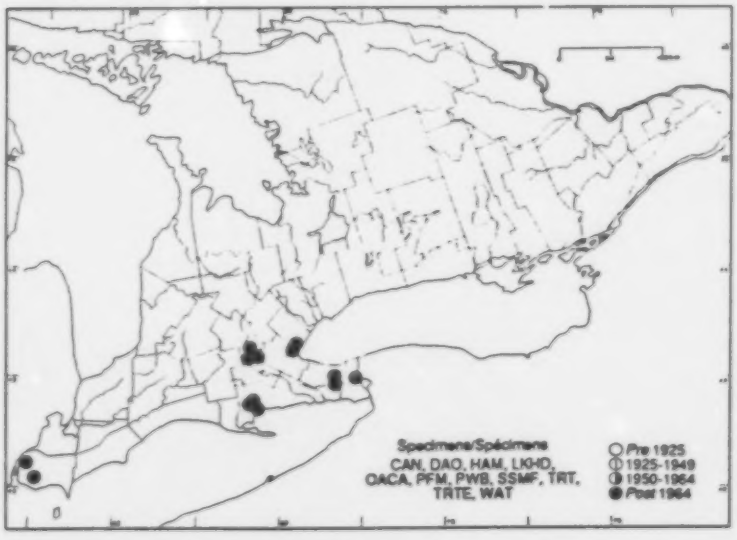




White and Maher, 1983

***Carya glabra* (P. Mill.) Sweet**
(including *C. ovalis* (Wang.) Sarg.)

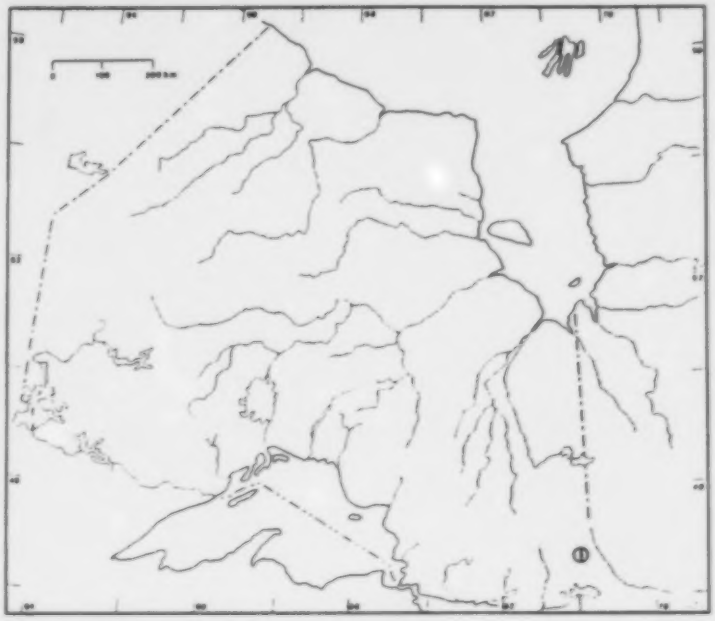
Pignut hickory
Caryer à cochons, caryer glabre

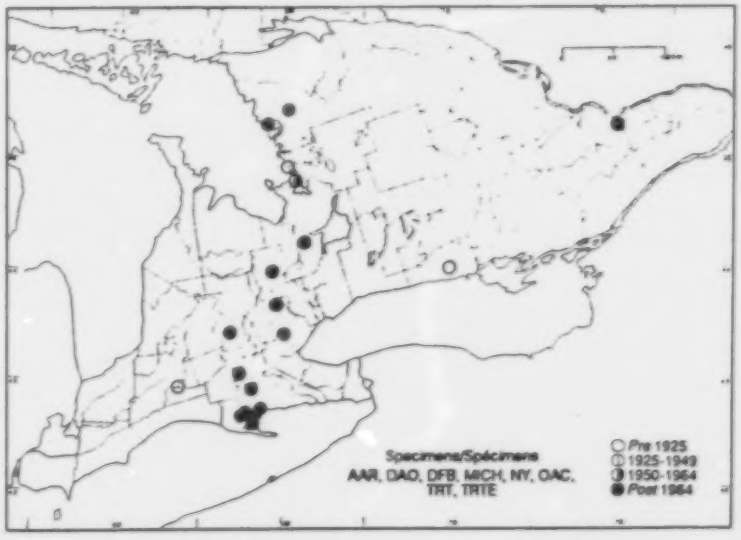


Ball and Ford, 1987

***Botrychium rugulosum* W.H. Wagner**
(*B. multifidum* (Gmel.) Rupr. f. *dentatum* R. Tryon,
B. ternatum auctt. non (Thunb.) Sw.)

Rugulose grapefern, ternate grapefern
Botryche rugueux

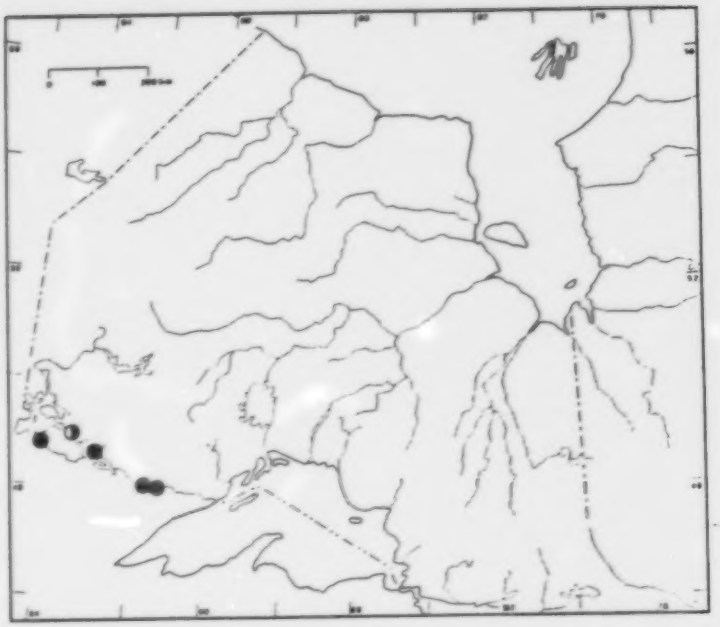


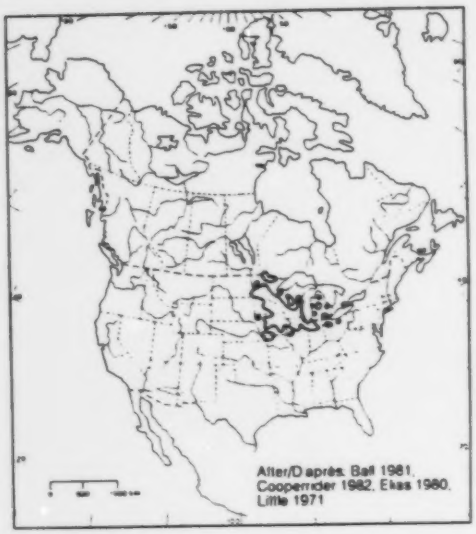


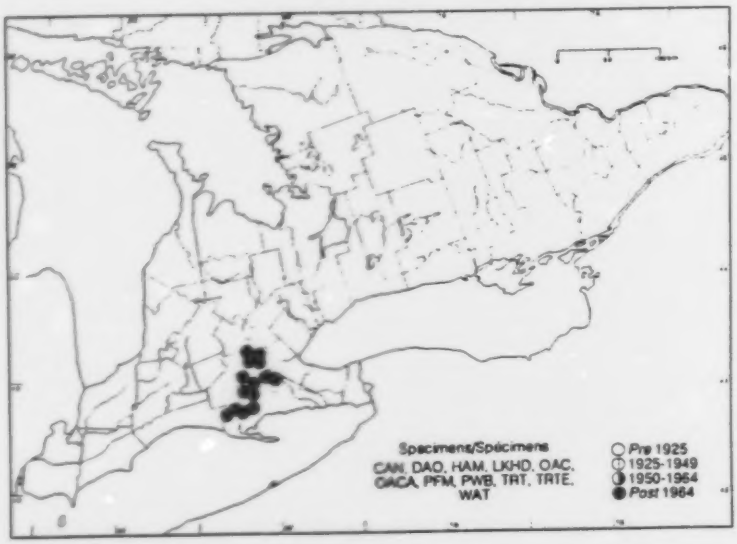
Pryer and Britton, 1987

***Quercus ellipsoidalis* E.J. Hill**

Northern pin oak, Hill's oak, Jack oak
Chêne jack



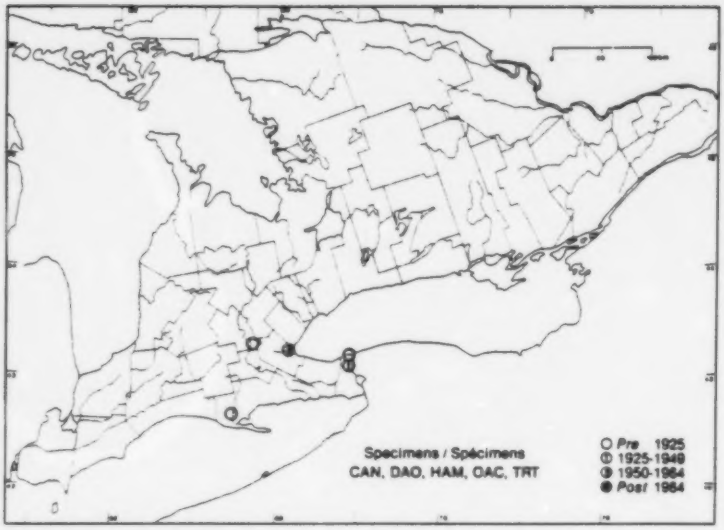




Ball, 1987

Aureolaria virginica **(L.) Pennell**
(*Gerardia virginica* (L.) BSP.)

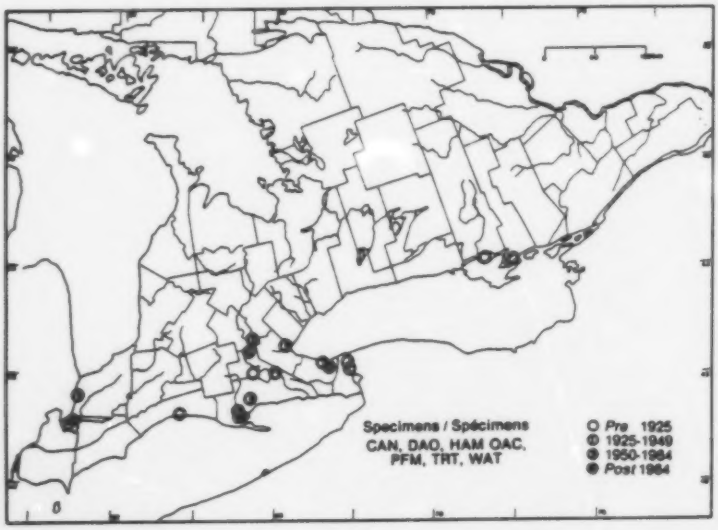
Downy false-foxglove
Gérardie



Canne, White, Maher 1983

Vicia caroliniana **Walt.**

Wood-vetch
Vesce de Caroline



Gillett 1984

APPENDIX C: BIRDS OF THE SUDDEN BOG

Fifty species of birds have been observed and are believed to breed in the study area. Breeding status codes follow those provided by Eagles and Cadman (1983). Unless otherwise indicated, all observations are those of the author.

BREEDING EVIDENCE

	Observed	Possible	Probable	Confirmed
Wood Duck	X			
Mallard	X			
Red-tailed Hawk[1]	X			
Ruffed Grouse[1]	X			
Wild Turkey	X			
Rock Dove[1]	X			
Mourning Dove[1]	X			
Black-billed Cuckoo[1]	X			
Great Horned Owl[1]	X			
Red-bellied Woodpecker	X			
Downy Woodpecker	X			
Northern Flicker	X			
Eastern Wood-Pewee				
Least Flycatcher[1]		SM		
Great Crested Flycatcher		SM		
Eastern Kingbird	X			
Tree Swallow				FY
Barn Swallow[1]	X			
Blue Jay	X			
American Crow[1]	X			
Black-capped Chickadee	X			
Red-breasted Nuthatch[2]		SM		
White-breasted Nuthatch		SM		
House Wren				FY
Veery[1]		SM		
Wood Thrush		SM		
American Robin				FY
Gray Catbird		SM		
Cedar Waxwing	X			
Yellow-throated Vireo		SM		FS[1]
Warbling Vireo[1]		SM		
Red-eyed Vireo		SM		
Blue-winged Warbler[1]		SM		
Yellow Warbler[1]		SM		
American Redstart		SM		

APPENDIX C: (cont'd)

Ovenbird[1,2]		SM	
Common Yellowthroat[1]		SM	
Scarlet Tanager[1]		SM	
Northern Cardinal		SM	
Rose-breasted Grosbeak[1]		SM	
Indigo Bunting[2]		SM	
Chipping Sparrow			FS
Field Sparrow[1]		SM	
Savanna Sparrow[1]		SM	
Song Sparrow		SM	
Red-winged Blackbird	X		
Common Grackle[1]	X		
Brown-headed Cowbird[1]	X		
Northern Oriole			FY
American Goldfinch[1]	X		

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[1] Included on the basis of observations made by B. Ralph and P.F.J. Eagles on June 17, 23 1977 (Ralph and Eagles 1977).

[2] Observed by J. Gould (pers. comm.) and S. Varga on June 23, 1987.

APPENDIX D: AMPHIBIANS AND REPTILES OF SUDDEN BOG

Common Name	Species	Source
Eastern Newt	*Notophthalmus viridescens*	DAS
Jefferson Salamander Complex	*Ambystoma jeffersonianum* Complex	DAS
Eastern Redback Salamander	*Plethodon cinereus*	DAS
American Toad	*Bufo americanus*	DAS
Spring Peeper	*Hyla crucifer*	DAS
Tetraploid Gray Treefrog	*Hyla versicolor*	DAS
Striped Chorus Frog	*Pseudacris triseriata*	DAS
Wood Frog	*Rana sylvatica*	DAS
Northern Leopard Frog	*Rana pipiens*	DAS
Pickerel Frog	*Rana palustris*	DAS
Green Frog	*Rana clamitans*	DAS
Painted Turtle	*Chrysemys picta*	DAS
Common Garter Snake	*Thamnophis sirtalis*	DAS
Eastern Ribbon Snake	*Thamnophis sauritus*	DAS
Smooth Green Snake	*Opheodrys vernalis*	DAS
Milk Snake	*Lampropeltis triangulum*	DAS

APPENDIX E: MAMMALS OF THE SUDDEN BOG

Common Name	Species	Source
Short-tailed Shrew	*Blarina brevicauda*	DAS
Cottontail	*Sylvilagus floridanus*	DAS
Gray Squirrel	*Sciurus carolinensis*	DAS
Red Squirrel	*Tamiasciurus hudsonicus*	DAS
Woodchuck	*Marmota monax*	DAS
Eastern Chipmunk	*Tamias striatus*	DAS
Meadow Vole	*Microtus pennsylvanicus*	DAS
Meadow Jumping Mouse	*Zapus hudsonius*	DAS
Raccoon	*Procyon lotor*	DAS
White-tailed Deer	*Odocoileus virginianus*	DAS

APPENDIX F: SLIDE DESCRIPTIONS

All slides are file with OMNR, Central Region, Parks and Recreational Areas Section, Aurora.

1. Aerial view southwest across northwest kettle showing, from foreground to background respectively, cultivated corn field, small prairie community (community type 9), dry oak slope forest community (community type 7a), open water lagg community (community type 1), tamarack-leatherleaf treed bog (community type 5b) and low shrub bog (community type 4), and mixed oak-maple-pine slope forest (community type 8b). July 1987.

2. Aerial view south across northeastern-most kettle showing small prairie community (community type 9), open water (community type 1) lagg, low shrub bog (community type 4), black spruce-tamarack-white pine treed bog (community type 5a), and dry oak-hickory forest (community type 8a), exhibiting evidence of heavy logging.

3. Aerial view north-northwest showing the following bog communities (foreground to background): leatherleaf low shrub bog (community type 4), open water lagg with drowned buttonbush (community type 1), leatherleaf-meadowsweet low shrub bog (community type 4), and tamarack treed bog (community type 5b). July 1987.

4. Community type 3a (buttonbush-dogwood-winterberry thicket swamp) in upland wet depression with dense blanket of duckweed (*Lemna minor, Spirodela polyrhiza*) covering surface of water. 1 September 1987.

5. View southwest across northwest kettle showing (foreground to background) open water (community type 1) with floating leaves of Pondweed (*Potamogeton natans*), emergent marsh (community type 2a) dominated by Bur-reed (*Sparganium chlorocarpum*), and tamarack treed bog (community type 5b) with dense tall shrub layer of Tall Blueberry (*Vaccinium corymbosum*). Note indvading cattails (*Typha latifolia*) along edge of bog mat. 1 September 1987.

6. View south-southwest of southern-most kettle showing leatherleaf-meadowsweet low shrub bog (community type 4), emergent marsh (community type 2b) dominated by Nodding Beggar-ticks (*Bidens cernua*), emergent marsh (community type 2a) with bur-reed (*Sparganium chlorocarpum*), and surface of open water (community type 1) covered by Duckweed (*Lemna minor*). 1 September 1987.

7. View across open water (community type 1) lagg with the water surface largely dominated by the floating leaves of Pondweed (*Potamogeton natans*) toward tamarack treed bog (community type 5b) with fringe of dead buttonbush. Mixed forest (community type 8b: oak-maple-pine) on slope in background. The log in the immediate foreground supports plants of both the provincially rare Small Beggar-ticks (*Bidens discoidea*) and the regionally rare sedge (*Carex comosa*).

8. Plants of the regionally rare False Foxglove (*Aureolaria flava*) growing on a steep, sandy slope in dry mixed forest (community type 8a).

AREA OF NATURAL AND SCIENTIFIC INTEREST – LIFE SCIENCE INVENTORY CHECK-SHEET

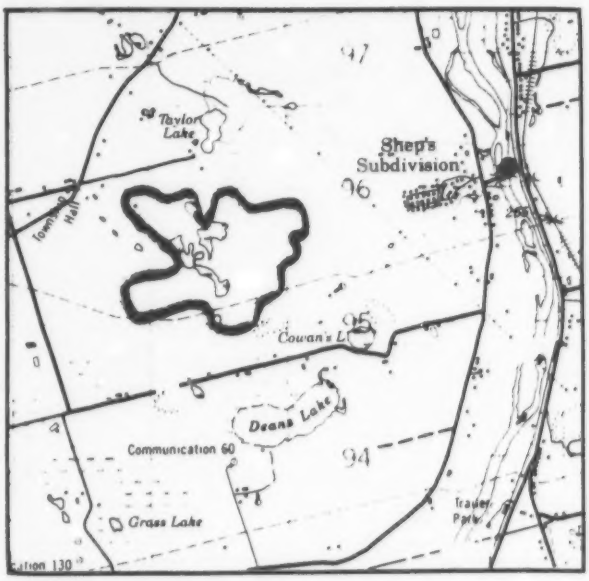
NAME	MAP NAME	MAP NUMBER	UTM REF.
Sudden Bog	Cambridge	40 P/8	533955

COUNTY, DISTRICT or REGIONAL MUNICIPALITY	LAT.	LONG.	ALT. MIN. MAX.
Waterloo	43 ° 19 ' N	80 ° 21 ' W	

LOCALITY 6 km SSW (Galt) Cambridge, 4 km NE Wrigley Corners

TOWNSHIP	LOTS	CONCESSIONS
North Dumfries	15-17	VIII

1:50,000 NTS MAP SHOWING AREA BOUNDARIES 1:250,000



AREA		OWNERSHIP
218 acres	87 ha	Private

ADMINISTRATION	
Private	

FOREST REGION AND DISTRICT	SITE REGION AND DISTRICT
L.1/D.1	7-6
MNR REGION AND DISTRICT	CONSERVATION AUTHORITY
Central-Cambridge	Grand River

AERIAL PHOTOGRAPHS — BASE MAP:

YEAR	ROLL	FLIGHT LINE	NUMBERS
1978	53	4322	408

PHYSICAL AND BIOLOGICAL FEATURES

Site District 7-6 is a broad till plain with intervening morainic ridges and spillway valleys. Within this area, Sudden Bog is situated in the Horseshore Moraines Physiographic Region. The existence and relative significance of the site were not recognized until as recently as 1977. It was subsequently included in a list of critical unprotected areas in the Carolinian Life Zone of Canada. Nineteen wetland, upland and anthropogenic vegetation communities occur at Sudden Bog. Wetland vegetation types are confined to kettles and depressions scattered through the uplands. Wetland vegetation types present in the study area include open water-aquatic with submerged and floating-leaved aquatics; emergent marsh; thicket swamps; leatherleaf (*Chamaedaphne calyculata*) low shrub bog; and, black spruce (*Picea mariana*)-tamarack (*Larix laricina*)-white pine (*Pinus strobus*) treed bog. The steep kettle slopes and tableland areas support a variety of upland forest types, including primarily oak and maple-dominated mesic deciduous forest; oak-hickory dry-mesic deciduous forest; and oak-hickory-white pine and oak-maple-white pine dry-mesic mixed forest. Several small remnant prairie communities are found along the kettle rim, at the north end of the study area. Anthropogenic community types include graminoid old field associated with the Pipeline Right-of-Way; old field regenerating in hawthorn and dogwood; and a small coniferous plantation.

A total of 412 species of vascular plants are recorded for the Sudden Bog, including 37 species considered to be regionally rare. Six of these species: Downy False Foxglove (*Aureolaria virginica*), Small Beggarticks (*Bidens discoidea*), Ternate Grape Fern (*Botrychium rugulosum*), Pignut Hickory (*Carya glabra*), Hill's Oak (*Quercus ellipsoidalis*) and Wood Vetch (*Vicia caroliniana*) are considered to be provincially rare. The majority of vascular plant species present at Sudden Bog are characteristic of the mesophytic woodlands of the region and southern Ontario generally. However, 42 species have Carolinian, northern or prairie/savanna affinities.

DATA SHEETS ATTACHED			
PHYSICAL DESCRIPTION	0	SUMMARY SPECIES LISTS	0
VEGETATION SUMMARY	0	PHYSICAL FEATURES MAP	0
EVALUATION SHEET	0	VEGETATION MAP	0
COMMUNITY DESCRS.	0	BIBLIOGRAPHY	0
COMMUNITY COMP. LISTS	0	PHOTOGRAPHS	0

MAJOR INFORMATION SOURCES

Ralph and Eagles 1977; field visits, 1987.

EVALUATION AND PRIORITIES

This area supports a relative undisturbed pond/bog complex with excellent life science features representative of kettle landforms in Site District 7-6. It contains significant flora (37 species), 6 of which are provincially rare, as well as 2 regionally significant bird species.

DATE COMPILED	COMPILER
December 1990	D.A. Sutherland

Fauna present in the area include 50 species of breeding birds, including the regionally rare Red-bellied Woodpecker (*Melanerpes carolinus*) and the Yellow-throated Vireo (*Vireo flavifrons*), both southern woodland species; 17 amphibian and reptile species; and 10 mammal species.

Ten areas were identified as significant due to good representation of wetland and upland vegetation, typical of the Horseshore Moraines and due to the presence of rare biota. Most of the significant areas were assessed as having extreme constraints to development. Generally, all wetlands and areas with very steep slopes within the study area were identified as having extreme sensitivity.

In terms of significant life science features and overall representative value, Sudden Bog, Paris Cranberry Bog and Oliver's Bog complement each other. Each represents a markedly different bog/pond association. Although there is some replication of significant features, each of these areas support significant vascular plant species not found in the others.

In terms of rare and/or significant features, Sudden Bog supports: 1) the best developed and least disturbed suite of bog/pond wetlands, supporting one provincially rare and 12 regionally rare plant species; 2) the best and most extensive dry-mesic deciduous oak/hickory slope woodland, supporting one provincially rare and seven regionally rare plant species; 3) the only prairie community association, supporting one provincially rare and five regionally rare plant species, and; 4) the largest and most intact fringe forest buffer.

MAPS
NOT
FILMED

CARTES
OMISES